NATIONAL LABORATORY COMPETITIVENESS ACT OF 1988

HEARING

BEFORE THE

SUBCOMMITTE ON
ENERGY RESEARCH AND DEVELOPMENT

OF THE

COMMITTEE ON
SCIENCE, SPACE, AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

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NATIONAL LABORATORY COMPETITIVENESS ACT OF 1988

WEDNESDAY, JULY 27, 1988

House of Representatives,
Committee on Science, Space, and Technology,
Subcommittee on Energy Research and Development,
Washington, DC.

The Subcommittee met, pursuant to call, at 9:35 a.m., in room 2325, Rayburn House Office Building, Hon. Marilyn Lloyd (Chairman of the Subcommittee) presiding.

Mrs. Lloyd. The Subcommittee on Energy Research and Development will come to order.

Good morning, ladies and gentlemen.

The purpose of today's hearing is to receive testimony on the draft bill, the National Laboratory Competitiveness Act of 1988.

I plan to introduce a version of Title I of the bill in the very near future. I can assure you that the vehicle which I will introduce will remain very close in principle to the draft bill which was sent to the witnesses for comment 10 days ago.

The intent of this bill is to expedite the technology transfer process from the DOE National Laboratory system. It does that through delegation of DOE authority to the field and through the spelling out of the specific authorities for cooperative R&D between the Laboratories and U.S. industries. I believe that it serves as a middle ground between Title IV of Senator Domenici's bill—S. 1480—and the position of the DOE on technology transfer.

Today we shall hear from Associate Under Secretary, Miss Donna Fitzpatrick, of the Department of Energy, and six of the National Laboratory directors or their designees.

I expect that we may learn some things today that will result in the modifications of the draft bill. I've already discussed some proposed changes to the bill with the staff. But the important thing is that we obtain an end product that will achieve our purposes.

I do think it is most constructive to have Miss Fitzpatrick here today since she has been very supportive of the spirit of the technology transfer process. I do share concerns that these new authorities would lower the quality of R&D done in the National Laboratories. But on the other hand, with seven years of Oak Ridge experience in technology transfer, as Subcommittee Chairman, I've become very impatient with the General Counsel's Office at DOE Headquarters. The slow approval of patent waiver requests by the

Laboratory contractor for third-party licenses has not been encouraging to United States industries.

I should mention Title II of the draft bill which calls for an interagency superconductivity R&D program. I decided to take the substitute bill up separately when we mark up the technology transfer bill.

I was planning to turn to my distinguished colleague, the Ranking Republican Member, Mr. Morrison, at this point. He has been delayed. He will be with us shortly and, without objection, his opening remarks will be in the record at this point.

[The prepared opening statement of Mr. Morrison follows:]

Opening Statement of Hon. Sid Morrison

Good morning, I am delighted to be here as our Subcommittee conducts this hearing in an effort to enhance technology transfer from our National Laboratories. Just a month ago we heard testimony from Drs. Alex Zucker, Al Schriesheim, and Sieg Hecker about the innovative ways National Labs have been using the expedite technology transfer to the superconductivity industry, and the need for Government agencies and Congress to provide the flexibility for National Labs to get industry customers through the door. We also heard that Government agencies need to convince industry that they are reliable and willing to help.

I believe we all agree that we need a mechanism to expedite technology transfer. It is important to react quickly if we want to be competitive, and for some technologies such as superconductivity, we must take prompt actions if we want to stay on top in the international marketplace. I also think that improvements in technology transfer can be made only through continual persistence that we will work hard together to make it happen, because there are benefits to be gained by all.

And that's a major reason why we're here this morning. I want to commend our capable staff for coming up with a piece of legislation that provides the flexibility for National Laboratories to offer a wider range of cooperation with industry, and the mechanism for them to complete contractual agreements more rapidly. I think this hearing gives us an excellent opportunity to listen to comments and feedback on the proposed legislation, so that we can be sure the provisions are realistic and workable.

I am pleased to see so many familiar faces here, and I want to add my congratulations to Miss Fitzpatrick on your promotion. I understand that you are a strong supporter for technology transfer, and that some changes in the Department of Energy to promote technology transfer are already happening, including the area of defense R&D. I look forward to hearing your comments as well as the comments from other distinguished witnesses today.

Mrs. Lloyd. Our first witness today is old friend of ours, the Honorable Wes Watkins from Oklahoma, who's presently a Member of the Appropriations Committee. He is a former Member of this Committee. He is our friend. We know you're a great fan of technology transfer, Wes. We are delighted to have you back with us this morning.

Mr. Watkins. Thank you.

Mrs. Lloyd. Your entire statement will be made a part of the record and you may proceed as you wish.

STATEMENT OF HON. WES WATKINS, THE REPRESENTATIVE IN CONGRESS FROM THE THIRD DISTRICT OF THE STATE OF OKLAHOMA

Mr. Watkins. Madam Chairman, I ask unanimous consent that my opening statement be included in the record.

Mrs. Lloyd. We welcome the Ranking Member of the Science and Technology Committee. Mr. Lujan is certainly one of the most valuable Members of this Committee, and a dear friend and associate, which I'm afraid we're going to miss in a great way pretty soon.

Without objection, your opening statement is made part of the record.

Wes, please.

Mr. WATKINS. Thank you, Madam Chairman and Members of the Committee, and also staff. It is good to be back. I had the good fortune of serving four years on Science and Tech and Banking and Finance, as Mr. Lujan knows. And it's been one of my cherished experiences because it's a very futuristic oriented type of Committee, and I enjoyed that very, very much.

And, Madam Chairman, I do have a statement. I'll make—if it's all right with you—make it part of the record.

Mrs. LLOYD. Without objection, it will be made a part of the record.

Mr. WATKINS. And I'll talk to you from my heart. And I thank you for allowing me to come and be here today.

My interest in technology transfer goes back many years and I really was able to get my teeth in it a little bit when I was on this Committee before getting on the Appropriation Committee just as we run out of money, and now I sometimes wish I was back here. [Laughter.]

Mr. WATKINS. Let me say my interest goes back to the point of using technology transfer to assist in economic growth and development in some depressed areas in rural Oklahoma—been depressed for five decades.

Madam Chairman, if you stop and reflect with me today, not only is this area—my State that I've been interested in getting technology transfer at work and trying literally to help build the economy—our entire country today has got some real economic problems. Many of our foreign allies and others have advanced quicker and faster than we have—some of the research and some of the technology, and they're implementing it.

So my interest goes to the point of, I think we need to make a full court press, a very comprehensive approach of trying to get technology out to the public and private sector in order to try to advance those benefits to the people of our society.

I'd like to share with you—I helped author part of the Stevenson-Wydler Act back in I think about 1978 or 1979, I think—I think back when I was on the Committee—which was Chapter 11, which I tried to get a certain percent of the research money set aside for technology transfer.

Literally, I started trying to get five—got down to two—finally, to tell you the truth, we got one-half of one percent to do technology transfer—our Federal laboratories into trying to get set up as a cuft, a Center of Utilization of Federal Technology, so we could centralize the technology.

I found—and I don't think we've progressed as far as we'd like. A lot of our research—or most of our research—happens to be shelved. We do $50 billion worth of research a year by the Federal Government, but we shelve most of it. At least a lot of that should give us some kind of answer—some kind of technology answers—and should be utilized in some way, or at least put on computers so that later on we could interface with it from either in Oklahoma, [illegible] or New Mexico, or some other State if we're doing certain research on certain areas or certain lines of work. That's the direction that we're supposed to be headed.

Now, Madam Chairman, if you reflect with me—my agricultural background brought me into this focus a decade ago. Agriculture has led the way. You know, we have the Extension service out there—or what we call in many cases, transfer agents—who would take the research at the Agricultural Research Stations, they take it, the Extension agent or the vo-ag teacher, bring it to me when I was a farm boy and said, "You know, Wes, if you'll use this fertilizer or this hybrid seed, technology transfer, you'll produce more." We did it in agriculture and we led the world in production of agriculture.

I think we can do the same thing if we provide the vehicle and the system with a lot of the other technology. NASA does a pretty good job. They have a mandate for technology transfer. We need to have a mandate in the Department of Energy that technology transfer be performed, not only here on the Washington level, but within our universities and also nonprofit entities, which I want to elaborate on just a little bit after while.

As I mentioned today, we're the world's largest debtor nation. We've fallen behind so far in the last seven years it's alarming, to say the least and put it mildly, of which direction we're going to be going in the future.

I have been trying to utilize technology in order to try to, yes, be more competitive on our area to develop new products and processes. Why? Because a new product means a new business; a new business means jobs. And that's what we've got to have in America, and that's what we have to have in a lot of the rural depressed areas.

Now, how do we focus on it—when I talk about a vehicle—I have gone into areas across this Nation, MIT, also in Columbus, Ohio; I've even gone into Ireland, talking about technology transfer with the public as well as private sectors.

Madam Chairman, it's this simple: when you look at working on ideas are for products. Everything that you see or touch today at one time was an idea. Even you and me, if we believe in the Creator. If you have an idea—this cloth we have on, this pen, this watch, whatever it might be; this microphone was created—maybe a crisis or whatever. But the first thing you have to have is do you have the technology there to make it. Like this stretch watchband right here. If I had—looked at putting this watchband together and that was invented because it's easy to get on and off your hand—the first thing you have to have is the technology to make it.

Well, if you have the technology, then the second question you ask is: Can it be marketed? If you've got the technology to make it, and you market it, you've got a product. And use those two other systems—two little steps you have to take: Do you have some financing to help that little entrepreneur to develop that watch—that watchband, or whatever it may be—and do you have a place to build it and start up with it.

What I'm saying is, we're actually implementing that in a nonprofit entity that I have in my district called an Industrial Innovation Technology and Finance Center, where we're working with generate ideas to solve technology problems.

You've always heard the statement if there's a problem, there's an opportunity. Well, if there's a technology problem, there's a technology opportunity. If we do reflective thinking and focus on it, usually you can come up with some kind of product to solve that technology problem. Now, what I'd like to encourage is the Department of Energy to send in a comprehensive program to try to do technology transfer and work with nonprofit entities across the United States. And let me emphasize—that's very important, that we have these opportunities in each State across our Nation—with our nonprofit entities as well also our universities. I think we'll see that the taxpayers' monies utilized a lot better. I think, without question, you'll see that—a great deal of benefits coming from this. The spinoffs coming out of NASA are unbelievable in being able to help in this modern technology society that we're in today. And we know full well if we reflect on what has happened in agriculture over the many years and the production agriculture—I think it shows that we have great benefits that could come from a technology transfer program in the Department of Energy.

In fact, I am already working with them, to a limited extent, through my Subcommittee on Energy and Water, and on the Appropriations Committee. I've been encouraging them to do that. And, Madam Chairman, when I saw through your leadership and the leadership of this Subcommittee, that you were contemplating making a full-scale effort in technology transfer with the Department of Energy, I wanted to come and lend my word and support—whatever little it may be—to say onward and forward; let's move forward within the Congress; and let's try to get the Executive Branch to up the speed and let's move out across this country, and become competitive in the energy field, anyway, along as with some of the other areas.

So that basically concludes my statement.

[The prepared statement of Mr. Watkins follows:]

Statement of

CONGRESSMAN WES WATKINS

Regarding

TECHNOLOGY TRANSFER AT THE DEPARTMENT OF ENERGY

Before the

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
SUBCOMMITTEE ON ENERGY RESEARCH & DEVELOPMENT

U.S. HOUSE OF REPRESENTATIVES

July 27, 1988

Madam Chairman:

Thank you for allowing me the opportunity to testify before your subcommittee today regarding technology transfer initiatives in general, and specifically technology transfer at the Department of Energy.

As you know, my interest in, and support of, technology transfer began during my early years in Congress, when I had the privilege to serve on this committee -- back when it was known just as the Science and Technology Committee. We worked long and hard back then to create through legislation a new initiative to promote what has become commonly called technology transfer.

What was merely a concept in some of our minds in the late 70's was crafted into legislation that was enacted as the Stevenson-Wydler Technology Innovation Act of 1980. I am proud to have authored Chapter 11 of that Act, and I am proud of what this Committee has done since then to continue to pursue the implementation, expansion and improvement of technology transfer programs in federal laboratories.

Although I am no longer a member of this Committee, I continue to be a strong advocate of technology transfer. My support is based not only on my past experience on this Committee, but also on my subsequent experience working with a technology transfer organization in my region of the country. In addition, I currently serve on the Appropriations Subcommittee that funds much of DOE, so I have developed a strong interest in the specific topic of your hearing today -- technology transfer at DOE.

Technology transfer is the transfer of federally-developed technologies from our national laboratories to application in the private sector. Technology transfer is crucial to our nation's future because technology transfer is vital to improving the competitiveness of American industry. We have to find ways to make American industry more competitive in the work market place. Positive-thinking inventors know that where there is a technology problem, there is a technology opportunity. The nation's laboratories are potential gold mines of information for solving problems for providing better ways to do things in the private sector.

Just developing new technologies is not enough. If the results of federal R&D are simple written up and shelved, the discoveries are seldom going to be transfered to implementation in the private sector where the discoveries and inventions could possibly be of great benefit. A pro-active program is needed which involves the federal labs' personnel in searching for secondary applications of federally-developed technologies.

Federal research scientists cannot do the whole technology transfer job. Private- and public-sector entities need assistance in searching for technologies which been developed at the federal labs that could be of assistance to their industry. To provide that assistance, I hope the committee will take the necessary actions to encourage DOE to enter into agreements with various non-profit entities and universities that are involved in innovation and technology transfer work in the various regions of the country. Such entities can provide the assistance desperately needed by private sector entities in searching through the maze of federal technologies for the one that could be of great assistance to their business.

In this time of fiscal restraint, more and more scrutiny is being given to all appropriation requests, including those for federal R&D. The more direct results people see from R&D programs, the easier the programs are going to be to justify in the future. Thus, the more we can do to promote technology transfer, the better for federal R&D as a whole. We all know that basic research programs are needed, yet if people can see concrete results -- technology applications -- from federal research and development programs, they develop a real appreciation for the benefits.

I salute and compliment the Committee for its interest in expanding and improving the technology transfer role of federal laboratories. I offer you any assistance I may provide in your efforts.

That concludes my statement. I would be happy to respond to any questions.

DISCUSSION

Mrs. LLOYD. Wes, as you say in prayer meeting at the Congressional Prayer Breakfast every Thursday morning, amen.

Mr. WATKINS. Amen. [Laughter.]

Mrs. LLOYD. It's just so refreshing for you to be our lead witness this morning. You were a great Member of this Committee. And I'm glad we've got a great Member supporting our cause in Appropriations, believe me. You're right where you need to be.

Mr. WATKINS. Well, I'll be there challenging them in the Committee because I think it's something that'll bring us up to the 21st century—and we need to be there.

If you look and see what the Japanese are doing, and many others, we're lagging. And, you know——

Mrs. LLOYD. If it had been adequately implemented—Stevenson-Wydler, eight years ago—we might see a crying difference not only in our balance of payments, but also improving the quality and the way of life for mankind. It's not just a monetary concept that we're working for.

Mr. WATKINS. Let me ask you, Madam Chairman, and other Members of this Committee, try to amend the Stevenson-Wydler to get more than one-half of one percent. We need to do that. I accepted that because at that time—10 years ago—technology transfer was just kind of bouncing around; wasn't even being focused on.

Mrs. LLOYD. It's sort of a buzz word.

Mr. WATKINS. That's right.

Today we're focusing on it. We need more than one-half of one percent of the dollars that go to the Federal laboratories for technology transfer. And the scientists out there are not the ones to do technology transfer. It's a different breed of cat, if you please—a person thinking and reflecting on how this might be able to be used some other way. Lots of times researchers or scientists are looking at something—a more pure research stage and not how it can be transferred and that technology used in something else.

So be sure and look at that little hangup we have in trying to permit Stevenson-Wydler.

Mrs. LLOYD. I think that—I don't mean to be too parochial—but I think in Oak Ridge we are a good example of what can be done. I'm not satisfied with our pace, but at least we're making, I think, a great effort. And I'm encouraged on that front, that we are doing a great more.

But I agree with you, that the funding is not there; the emphasis is not there; and if not now, when?

Mr. WATKINS. Right.

May I ask to comment also, I know our Senate colleague's here.

You know, just as we've had Agricultural Extension agents, it's a shame we don't look at, saying, "All right, we're lagging in technology, we're lagging in industrial growth and development. We need industrial business and industrial technology transfer agents out there across America in order to try to implement this quicker and faster with business and industry."

Mrs. LLOYD. One that Dr. Dugan and I were just commenting on is that a former colleague. Dr. Ray Thornton—now at the University of Arkansas—when he was a Member of this Committee, promoted the Energy Extension Service—similar to the Agricultural Extension Service.

Mr. **Watkins**. Exactly. I remember that.

Mrs. **Lloyd**. Mr. Morrison?

Mr. **Morrison**. No real questions, Wes—we love your enthusiasm. It shows in everything you do.

Our experience—I think Mrs. Lloyd and I both have spent a lot of time on this subject area—indicates that the mechanism for transfer and the attitude within local laboratories is vitally important. And in Appropriations you certainly can help us add a few dollars to that mix and make it happen. Appreciate your support. This is something we're all enthusiastic about.

Mr. **Watkins**. Let me share just one other little thing. I've initiated a new product process fair in my area—to be proactive, to generate ideas. I'm trying to put every mind at work in my area of the State of Oklahoma in this economic depressed area, to come with ideas for new products and processes.

Five years ago we came with 41 new ideas of new products. This past year, five years later, we had 317; 127 of those were prototypes. Giving birth to new industry's kind of like giving birth to a baby—it's your creation; it's your pride, your seam. It's changing the attitude in my rural economic depressed area with more of a can-do attitude. And we're really initiating this in a full force in our area of State. And I'd like to think it's—we have six Congressmen; I have 16 percent of the population, and the lowest income, highest unemployed economic depressed area. But last year we created 37 percent of the new jobs in Oklahoma. And I think part of it is because of a changing attitude that's taken place in a proactive way of creating. And we'd be teaching creativity and ingenuity, entrepreneurship, and we're doing that in some of vo-tech schools. We've initiated that change and it's working.

Mrs. **Lloyd**. Mr. Lujan?

Mr. **Lujan**. I have no questions. I just like Wes' enthusiasm—happy that you could be here.

Mrs. **Lloyd**. Thank you very much.

Mr. **Watkins**. Giving birth to industry.

Mrs. **Lloyd**. Mr. Hockbrueckner?

Mr. **Hockbrueckner**. No questions, Madam Chairman.

Mrs. **Lloyd**. Mr. Walgren?

Mr. **Walgren**. No questions, Madam Chairman.

Mrs. **Lloyd**. Thank you very much, Wes. Any time you want to come back to the Committee, we'll be glad to have you.

It's also a pleasure to welcome our next witness—a great friend of ours, and his original bill stimulated a great interest in this legislation. We do welcome Senator Domenici. We're delighted to have you here to give us the benefit of your views of the proposed bill. Of course, your entire statement will be made a part of the record, and you may proceed as you wish.

STATEMENT OF HON. PETE V. DOMENICI, A U.S. SENATOR FROM THE STATE OF NEW MEXICO

Senator **Domenici**. Thank you very much.

Let me first say to the Committee and in particular to you, Madam Chairman, I'm pleased to have an opportunity to talk with you this morning. I don't have a prepared statement so I will just talk for a few minutes—and, please, if I go on too long, considering the list of people that you have who are truly scientists and manage these laboratories, you cut me off if I talk too long.

Mrs. LLOYD. I can assure you we're delighted to have the benefit of your thinking—your wisdom. And we won't be cutting you off this morning.

Senator DOMENICI. Let me first say, I don't want to overstate the case. I personally think we somehow or another in this country are talking too gloomy about America. I think we're doing quite well. As a matter of fact, I just had a recap of the economic growth for the last quarter, and we were wrong again—on the low side. The growth was 3.1 percent. I think sometimes we sit around and look at what's happening to the United States and we think for some reason all these new jobs and all this new growth is different than it was 15 or 20 years ago, and that there's something miraculous around that would make it all better. I want to start by telling you I'm not one that believes that.

I believe we're considering where we were as a Nation, and the kind of competition we were faced with 10 years, I'm pretty upbeat about the American enterprise system and the American economy.

However, I'm very concerned about the fact that the future is indeed more intimately tied to science than ever before, and to scientific breakthroughs. And the reason I say that is that it should not take very much insight to tie two things together and come up with a conclusion that change in the United States and in the free industrial world, at least, is going to occur much more rapidly than ever before. If you tie computers with their evolution and growing strength to the research capabilities of man in the normal laboratory, one would just have to conclude that the results on the positive side of breakthroughs are going to occur exponentially because computers have added such an enormous capacity to the ability to synthesize knowledge and make breakthroughs. That's point number one.

Point number two: The reason we ought to focus on the Department of Energy and their laboratories is very simple, because they are the largest accumulation of scientists and engineers in one institution, or under one institutional management head in the world. We look around and we think it's universities; we think it's National Institutes of Health, but that isn't true. The number of scientists and engineers under one roof, so as to speak, institutionally and managed by a set of rules and governed by a person happens to be the Department of Energy—with somewhere between 18,000 and 23,000, depending upon how you figure it—under their control. Nothing comes close in terms of numbers and capability.

A third point: They have not in the past, because of the distinction we in this country make between academia, private sector, and public research, there is no question that they are not user friendly, they have not been expected to be. We didn't expect the private sector to use them and they weren't expected to be used by it.

In our past, we could perhaps have 16 to 20 million scientists and engineers with a budget of somewhere between $7 and $10 billion; we could perhaps have been single purposed, unrelated, so as to speak, to the American economy, and we were so wealthy that we probably could get by with it. We did. We had great duplication in our scientific effort for maybe four decades, and that caused us to be number one in science—we still are.

If the Japanese—if we keep wondering about them and what they think about us—I can assure you if there's one thing they are worried about it is American science. They almost have a paranoia about the fact that they are not as good at science as we are. And we sit over here worried about them because they are doing a better job of applying science to the marketplace. They're producing better products with more frequency, and we're scared to death right now that they may take some new breakthrough ideas, like superconductivity, and they may make the market breakthroughs; they may and they may not.

Of late I've talked with them on how they're doing it, and they're just as frightened as we are. They're busy putting together institutions on superconducting, on genome mapping for future diagnostic capabilities in wellness and health. And if you wonder why those are some of the first chapters and titles in my bill, it's because those are areas that are now known.

I'm very pleased that this Committee, under your leadership, has taken the technology transfer and the laboratory cooperation part of the bill that I have in the Senate, and you have reworked it your way. I've not had a chance to read it in its entirety, but let me congratulate you for moving in that direction and say that we're going to try to move on ours and maybe we can get to a conference one of these days.

The Department of Energy has a tough job because they are supposed to be running laboratories. They're scientifically oriented and they're supposed to be running some laboratories that are single purposed in their origin, and that was to maintain America's nuclear deterrent—so they've done a marvelous job at those three laboratories. All by themselves they have maintained America's nuclear deterrent by their scientific prowess.

But when you put so many scientists with such diverse backgrounds with the great quantities of money that we're able to give them for equipment—I mean they're expert in many, many things.

The Department of Energy, in my opinion, over the years, has been far too zealous and concerned about maintaining that single-minded and single purpose of those laboratories, and have been fearful that if they diversify they would lose their thrust—lose their capability in their primary mission. I'm not worried about that.

As a matter of fact, I think they can do both better, and the more flexible we permit them to be, it's my opinion that we might get better science rather than poorer science. I think it's exciting for scientists to go to a laboratory that has a diversity of capability; even as to those three giant nuclear laboratories.

In essence, I have come to the conclusion that even though we can't get it done, that the Department of Energy is misnamed. As you know, that's an accident, for the most part, as to how the darn thing got started anyway. But I think it really is more a Department of Science and Technology than it is a Department of Energy. But I think I could do all those things.

Someone said the solution to this constant turmoil is just change it and call it more than a Department of Energy. Frankly, I've thought of that, but then when I look at who has jurisdiction to just change three names I'm more willing to fool around with the bill. [Laughter.]

Mrs. LLOYD. It's sort of frightening that we thought of abolishing this Department, and now we realize that we need to expand the authority——

Senator DOMENICI. That's correct.

Mrs. LLOYD [continuing]. The mission of——

Senator DOMENICI. On the other hand, in our body I think it would go to three Committees and I haven't decided how many here, so I think maybe we ought to continue on trying to change its direction.

Let me close, however, with these remarks. The Department will testify they now have documents which will clearly indicate, if they don't—we've seen them, if they don't bring them here—where they are now out telling their laboratories and telling their central bureaucracy here, including their lawyers, that they are going to do most of the things that your bill recommends, and most of the things that my bill recommends. And they are then saying, "Why do we want Congress involved? Why don't we just use our good discretion and do it?" I compliment them. They are beginning to move in that direction.

However, I do not have confidence that there would be the continuity of effort in such things as discretionary entering into contracts with the private sector; set the size, set the scope. I think we would have ups and downs, depending upon the Department and its attitude, and the Secretary, and the lawyers involved. They have an awful lot of lawyers there. We might one day have a separate hearing on just how many.

Mrs. LLOYD. I wonder how many Committees that would go to.

Senator DOMENICI. And they also are very, very good in patent law, for some reason. They don't patent much, but there are patent lawyers galore. They are there because it used to be a problem. At one point it was a terrible problem, because we owned all the nuclear research and we——

Mrs. LLOYD. Right.

Senator DOMENICI [continuing]. Had the private sector building it so we needed some real strong patent lawyers.

But in conclusion, it seems to me that the Department is starting to make an argument that they will do it without us; and they are even beginning to make an argument since one of the reasons they ought to do these things is because if they don't, we're going to. And I've seen that in one of their schematics—one of the reasons—if we don't move in this, Congress will.

Let me say to the Committee—I think that's a very good reason for us to do it; to go ahead and set the guidelines for making them more user friendly. And let me give you my last remarks as to why.

I believe without us stating it, and being more legislatively specific, I am fearful that the laboratory directors doing it on the discretion of the Secretary—telling them they should or could—I believe they will be less apt to be enthusiastic about doing it than if we clearly define their mission, because there is a risk involved. There is failure potential. There is mistake probability. And if they're doing it on pure discretion, without us having told them, then it seems to me they might get burned once and they'll quit doing it. And they're all going to make some mistakes. This is not a utopia; it is not going to solve all of the technological problems of the United States.

What it might do is use a little bit more, the huge expertise accumulated in these labs in relationship with either academia and the private sector in the evolution of applied science and research. And I think we ought to do everything we can to maximize that; do it in an orderly manner that will not interfere with their primary mission; and set the mandate in a way that will permit flexibility, versatility, and protect our Government.

And I think we can do that. We can mandate licensing and patenting, and proprietary right acquisition, and with march-in kinds of rights—if they don't use it, we can come back in and exercise our rights. We can protect our laboratories from doing more than they should by not letting them keep the royalties if they exceed a certain amount, put them back in the Treasury. There are ways. After four years of working on it, we have heard a problem for every single answer we had and we think we've come up with a solution.

I have also come up with frustration. So I don't think we can ask the Department too many more times what they recommend. They're nice people. The Assistant Secretary's my dear friend. She will be testifying here. But we just get to a point, where after months and months and months we just have to do something. We can't wait around for them to agree on everything. They're not going to. Some of the things they want to maintain within their discretion, I think we just have to decide that part of it is legislative and go ahead and do it.

Thank you very much.

Mrs. Lloyd. Thank you so very much. I'm very upbeat from your testimony, and Congressman Watkins', too.

You know, the only way to avoid a mistake is to do nothing. And we know there will be mistakes made; that we won't make a hundred on every decision that be made. But it's sure a whole lot better than doing nothing; and that's where we are right now.

Senator Domenici Thank you, Madam.

Mrs. Lloyd. Thank you so much, appreciate it.

Of course, our next witness who we've been looking forward to is the Honorable Donna Fitzpatrick, who is Associate Under Secretary for the Department of Energy. She will give us the Department's perspective on the proposed legislation.

As Assistant Secretary, Miss Fitzpatrick has been aggressive in interpreting the technology transfer mandate of the Department. So we look forward to working with her on arriving at a legislative vehicle that will accomplish our mutually shared goals.

Donna, your entire written statement will be made a part of the record. We're just so delighted to have you here this morning, and you may proceed as you wish.

STATEMENT OF HON. DONNA R. FITZPATRICK, ASSOCIATE UNDER SECRETARY, U.S. DEPARTMENT OF ENERGY WASHINGTON, DC

Miss FITZPATRICK. Thank you, Madam Chairman, I'm very happy to be here.

I do have a longer statement; if I may, I'd like to make an oral one.

Madam Chairman, I appreciate the opportunity to appear before you and the other Members of the Subcommittee today to discuss our technology transfer and laboratory university/industry collaborative efforts in the context of the proposed National Laboratory Competitiveness Act of 1988.

We very much appreciate the willingness of the Committee to consider our views on the bill and also the very constructive efforts that have already been made to respond to our concerns. We believe it is vitally important that this type of dialogue continue.

As Senator Domenici has already pointed out, the Department, and its predecessor agencies, and the National Laboratory system were not established with the primary mission of collaborating with American industry. This is a mission which has been undertaken at the direction of the Congress and the President and it is fully supported by the Department. It is a natural extension of our primary missions, and it actually supports them.

But because it is a relatively new policy we are still learning, and each initiative brings a response with many constructive suggestions to improve it. For this reason there is now a standing committee in the Department on technology transfer, which is made up of Assistant Secretaries and Operations Office Managers. Their responsibility is to review the tech transfer activities of the Department, and the policies, and to make recommendations for their improvement.

The Committee has both Headquarters and field personnel so that it will have a broad view. It is at a high level to assure that many of its decisions can be immediately implemented within the authorities of the Assistant Secretaries and Operations Office Managers and that other decisions can be readily referred to the Department's most senior management.

Although the Department fully supports the goal of the bill, based upon preliminary review we have a number of concerns with specific provisions and some suggestions to make. Therefore, although we cannot make a statement of support for the bill in its present form, we are most happy to continue to work with the Committee in this matter.

The Department has been very active in this area of technology transfer and industrial collaboration, and we have taken a number of actions very recently which are related to them, and I'd like to take this opportunity to mention a few.

Earlier this year, two task forces, with Department-wide representation, conducted a review of the Department's intellectual property activities and policies, and analyzed possible options for encouraging private sector collaboration in implementing the President's superconductivity initiative.

As a result, we have recently established a new policy for the copyright of software developed in the course of research by the Department's contractors. Also, three National Laboratories were designated by the Secretary as Superconductivity Pilot Centers. These Centers are located at Los Alamos National Laboratory, Argonne National Laboratory, and Oak Ridge National Laboratory.

The Pilot Centers will test innovative concepts in laboratory collaboration with industry as well as new approaches to the transfer of intellectual property rights to industry. These Centers and the Operations Offices, which directly supervise them, will have delegated authority to make decisions in the field, and they will have standardized documents which will speed the consummation of agreements between the industry and the Department and its contractors.

It is important to note at this point that these initiatives are moving ahead expeditiously. However, the innovative nature of these efforts requires deliberate planning and implementation procedures to assure successful collaboration between National Laboratories, universities, and industry.

Just as there are many different types of collaborative and cooperative agreements, there are also significant differences among the laboratories themselves, especially between the Defense laboratories and the Energy Research laboratories.

As we continue our discussions of the proposed bill, this diversity, with its attendant need for flexibility, is one factor which should be taken into account. In general, it is essential to fruitful collaboration between industry and the laboratories, that industry be assured of access to intellectual property rights and that the laboratory contractors have sufficient flexibility to deal with the great variety of industry participants, forms of collaboration, and types of information and intellectual property which will be generated.

For example, a small business might have an innovative idea that they want the laboratory to test for them, but little cash to support the experiments. They might also be interested only in a license to use any resulting technology for a particular application and not want title to the patent itself.

In that case, the laboratory contractor could draw on Government funds, as authorized, to support most of the project cost, and then retain title to the resulting patent, which it could then license to other users for different applications.

The operating contractor of Oak Ridge National Laboratory is successfully following this type of strategy with the patent for nickel aluminide.

Another kind of situation is presented by a large business which wants to use the unique expertise and facilities of a laboratory and is willing to pay most of the cost. That business might have the interest and capability of using a resulting invention in a variety of applications and of managing its licensing to others. That business would probably want title to the patent with the Government retaining a royalty for use for itself and its contractors.

These are just two of many variations on industry/laboratory collaboration. It is impossible to describe or even foresee all of them, and that is why legislation must allow sufficient flexibility to assure industry that the Department and its contractors can and will meet their needs.

We have supplied the Committee with several reports, one of which was completed just this month, on technology transfers in the Department. I hope you will find this useful and appreciate the variety and the very rapid growth of the Department's efforts.

In addition, we have several guiding principles that we believe are important in our discussion of the bill. The authority of the Secretary to manage Government funds, be responsible to Congress for their use, and for the use of Government property must be retained, while at the same time providing for the expeditious approval of collaborative R&D agreements and the transfer of intellectual property rights.

Intellectual property which has commercial value should be transferred to the party which is most capable of commercializing it, and national security information should be protected from unauthorized dissemination.

The Government should retain adequate rights to technical data to permit scientific discussion and development of derivative works. Cooperative work at the laboratories must not interfere with the central mission of the laboratory and the National Laboratory should serve as resources to industry and not as competitors.

In conclusion, given the need for flexibility, the initiative that the Department already has under way to improve our efforts in this area, and the extensive authority the Department has to carry out these efforts, we believe that any legislation must maintain the options that are already available.

We will keep the Committee informed of the lessons we learn from the Pilot Centers and our other initiatives, and of any need for additional assistance that may become apparent as a result of these experiments.

Madam Chairman, we appreciate the very constructive dialogue we have had with the Committee on this bill, and we look forward to continuing our discussions in the same spirit.

I will be happy to try to answer any questions that you or the Members may have at this time.

[The prepared statement of Miss Fitzpatrick follows:]

STATEMENT OF

DONNA R. FITZPATRICK

ASSOCIATE UNDER SECRETARY

U.S. DEPARTMENT OF ENERGY

BEFORE THE

SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT

OF THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

JULY 27, 1988

Madam Chairman and Members of the Subcommittee:

It is a pleasure to be with you to discuss the technology transfer efforts of the Department of Energy (DOE) and the proposed bill, the "National Laboratory Competitiveness Act of 1988." As requested in the Chairman's letter of invitation, my remarks will focus on Title I of the proposed bill.

The Department fully supports the goal of the bill, which is directed toward improving technology transfer and supporting research in superconductivity. Secretary Herrington has often emphasized the Department's commitment to both effective technology transfer and research in high temperature superconductivity. The Department strongly believes that research results and intellectual property rights should be transferred to the private sector, as called for in Title I, in a manner which provides incentives for commercialization, provides the proper accountability for public funds, supports the missions of the National Laboratories, assures that adequate rights are retained to accomplish Government purposes, and assures that the laboratories serve as resources to industry rather than as competitors. Although the Department cannot support the bill in its present form, we would be happy to work with the Committee in this matter.

Through cooperative research, our goal is to accelerate the commercialization of technology developments resulting from research in the National Laboratories. The record of the

Department and its laboratories is certainly in line with the objective of the bill of facilitating collaboration between the National Laboratories, universities, and industry to enhance the science and technology base that supports industrial development. Historically, DOE laboratories have developed the technological base for entire new industries, such as nuclear power and nuclear medicine, as well as making major advances in supercomputers and precision machining and engineering.

Many technologies have been transferred to the private sector covering a wide range of technical applications. The list of sucessfully transferred technologies is extensive and growing rapidly. Some specific examples of technologies that have been transferred from DOE laboratories to the marketplace which reflect this diversity include a cell separator that aids in cancer treatment, a diamond-tipped drill bit for oil exploration, and a low-to-medium temperature solar heat collector system to provide cost effective electricity generation and inexpensive hot water to industry. Although very different, each of these technologies resulted from Federally-sponsored research in DOE laboratories, and each crossed the traditional boundaries separating government, industry, and the academic community as it moved into the commercial marketplace.

The Department's impressive record in technology transfer continues to grow. Let me cite just a few statistical examples. Last year, scientists and engineers at DOE laboratories received 30, or nearly one-third, of the IR-100 Awards presented by Research and Development Magazine annually for the most significant developments in technology products, processes, and materials with market potential. Since 1981, the number of industrial users participating in experiments at the major DOE user facilities has nearly tripled. In 1987 over 1,600 users took advantage of these experimental facilities resources at the laboratories. Over $118 million in research and development was performed by our laboratories directly for industry. The number of new companies that were formed based on DOE laboratory technology has increased five-fold since 1981, with over 100 companies formed since 1985. Royalties to DOE and its contractors increased to $297,000 in 1987, nearly doubling over the previous two years. For the first half of 1988, royalties have already reached over $428,000. In addition, DOE scientists have recently been awarded 14 of the 30 Federal Laboratory Consortium annual awards for excellence in technology transfer.

In a recent example of one method used to transfer technology, the Department waived its patent rights to a DOE process developed to remove nitrogen oxides from the exhaust gases of engines and furnaces. The process, which may have commercial applications for cleaning combustion exhausts, is called RAPRENO_x. It was invented at Sandia National Laboratories-Livermore and received a 1987 IR-100 award. The inventor has since left the laboratory, formed his own company, and intends to market his innovation.

The Department has consistently supported technology transfer initiatives and efforts aimed at reducing institutional barriers to the transfer of technology from its laboratories. Numerous improvements have been made in recent years, including providing more flexibility for laboratory staff to consult for industry and developing class waivers for patents originating from user facilities and work-for-others agreements. A computer software policy to allow contractors to copyright and license software has been finalized recently and has been issued as an instructional letter to the Department's contracting officers. Standard contract language has been prepared and our first contract implementing this policy has been signed. Significant progress has been made to provide DOE's nonprofit contractors with the right to elect to retain patent rights in all areas, except defense and other sensitive programs. To date, contracts for 13 of the 14 major nonprofit laboratory contractors have been modified. In the past year DOE laboratory contractors have retained title to at least 162 inventions, which is five times the number of any previous year.

DOE is now required by law to process waivers on the defense-related exceptions within 150 days. For the for-profit contractors, the Department has developed a proposed rule for class patent waivers that is currently under final review before publication, consistent with rulemaking procedures.

There are several recent examples of improvements in DOE technology transfer through the licensing of technology developments to interested users. In 1987, the DOE laboratories issued 37 licenses for DOE developed technology. Several of the laboratories are establishing adjunct organizations to license new technology to interested users. An example of such an organization is ARCH, at Argonne National Laboratory, which has now issued two licenses. Whisker-toughened ceramic composites, developed at Oak Ridge National Laboratory, have been licensed to industry for application in cutting tools and parts exposed to heavy wear. They can operate at ten times the speed and last seven times as long as conventional materials.

We expect the Department's solid record of performance in technology transfer to continue to grow, aided in part by new initiatives aimed at promoting increased cooperation among Federal agencies, universities, and industry. It is the Department's standard operating procedure to carry out non-defense research activities in conjunction with industry, with cost-sharing wherever possible, and industry involvement from the inception of research projects. This involvement of industry in both sharing the cost and in assisting in the planning and execution of research assures that the research which is conducted is of value to industry and that industry is fully informed of the results of the research. Of note among these initiatives is the President's April 10, 1987, Executive Order No. 12591 on Facilitating Access to Science and Technology. The overall thrust of the Executive Order is to ensure that all Federal agencies and laboratories assist universities and the private sector in broadening the technology base by moving new knowledge from the research laboratory into development of new products and processes. It has provisions for establishing consortia among laboratories, universities, and industry. The Department's new policies with respect to intellectual property and its continuing efforts to improve its procedures will carry out the mandate of E.O. 12591.

Recently, the Department has also taken steps to improve laboratory/university/industry interactions which would accomplish most of the objectives of the bill. As an example of one such step consistent with DOE's national security responsibilities, the Assistant Secretary for Defense Programs is implementing a program for identifying technology transfer mechanisms and incentives that would accelerate commercialization.

We believe that the Defense Programs area is a prime source of valuable applied technology. It also is a national asset in the management of industrial technologies whereby advances in new technologies in one field spur advances in another. We are optimistic that the outcome of this effort will significantly enhance the technology transfer efforts of the weapons laboratories and perhaps contribute to U.S. competitiveness. We think we can develop a greater sensitivity and responsiveness on the parts of the national laboratories carrying out DOE's defense programs with U.S. industry. Our efforts so far indicate this can be done quite compatibly with the laboratories' primary national security mission. Critical to this initiative is the perspective that these laboratories should serve as resources and partners to U.S. industry, not competitors. These steps will allow DOE and the laboratories to grow in our understanding of the needs of industry while maintaining the central mission of the laboratories. We plan to keep the Congress fully apprised and to seek advice as we pioneer in this new and we believe very fruitful area.

COMMENTS ON PROPOSED BILL

Obviously, with the limited time available to review the bill, there has been no time to develop a uniform Administration policy. Therefore, our comments will necessarily be of a general and preliminary nature.

As I noted earlier, the Department agrees with the goal of the proposed bill. The bill includes provisions which would streamline the process for both approval of laboratory-industry cooperative agreements and for transfer of intellectual property rights to the laboratories. The bill also acknowledges the need for Federal accountability for public funds. Further, the bill would provide for intellectual property rights to be transferred out of the Government in order to provide an incentive for commercialization. The intent of these provisions is laudable. However, a preliminary review of the bill indicates that there are several specifics of how the bill would seek to accomplish its goals that are matters of concern to the Department.

First of all, it should be pointed out that the term "National Laboratory" does not refer to an autonomous legal entity. There are only two legally recognized parties involved: the Government and the contractor who manages and operates the laboratory. The laboratory itself is simply a government-owned facility. The definition of "National Laboratory" used in the bill to refer to the contractor seems to blur this distinction.

Secondly, the Department is already undertaking efforts to streamline and speed up the process for approval of laboratory-industry cooperative agreements. We strongly support the approach of using generic agreements and generic contract clauses to permit expedited review of cooperative agreements. However, while contract clauses can be approved in advance, the overall agreement must have Government approval. The Department strongly agrees with the need for delegated authority to approve agreements at the field level. It is important to maintain the clear line of authority from the Secretary to the contractor and maintain the responsibility and discretion of the Secretary as the Federal officer responsible for the use of Federal funds and property. We believe that it is inconsistent with sound management principles for either a government employee or a contractor employee to hold authority not available to his superiors, such as is proposed to be statutorily granted by this bill.

We believe that the focus should be on the goal of expedited review and approval of agreements rather than the mechanism by which review and approval would be accomplished, so as to avoid attempting to micromanage administrative actions. As a part of the Department's high temperature superconductivity pilot center initiative, we will be testing various methods by which this process of review and approval of agreements can be streamlined. We believe that it would be most appropriate to complete this effort in order to determine which method or methods are most effective. Further, the Secretary has authority under current law to delegate such approval authority to the extent that such an approach is deemed the best method to speed up the approval process. Additional authority would, therefore, be redundant, and thus, unnecessary.

With regard to the intellectual property provisions of the bill, the Department believes that further specification is needed. The bill would permit a distinction to be made between results of basic research and applied research to permit basic research results to be broadly disseminated as under current law. However, since no definition of basic research is provided, the decision as to the classification of the research appears to rest with the contractor. This could result in a great deal of uncertainty for potential industry collaborators or could lead to basic research results being withheld.

The Department has several other concerns with the intellectual property provisions as currently proposed. In general, it is essential to fruitful collaboration between industry and the laboratories that industry be assured of access to intellectual property rights and that the laboratory contractors have sufficient flexibility to deal with the great variety of industry participants, forms of collaboration, and types of information and intellectual property generated. It is our experience that industry is sometimes reluctant to collaborate with the National Laboratories due to a perception that they will not be able to obtain the intellectual property rights.

CONCLUSION

In announcing the Executive Order 12591 on Science and Technology, the President stated that "a vigorous science and technology enterprise involving the private sector is essential to our economic and national security as we approach the 21st century....It is important not only to assure that we maintain

American preeminence in generating new knowledge and know-how in advanced technologies, but also that we encourage the swiftest possible transfer of federally developed science and technology to the private sector. All of the provisions of this Executive Order are designed to keep the United States on the leading edge of international competition." I believe that the Department currently has the Executive Office support and the legislative authority that it needs to move toward both the President's goals and those of the proposed bill.

The Department agrees with the goals of the bill, but we have serious concerns about legislating particular procedures in the operation of the agency, the laboratories, and interactions with industry. Successful technology transfer requires the ability to deal flexibly with the needs of companies and with different types of technologies. Although we cannot support the bill in its present form, we look forward to working with the Committee to increase the flexibility permitted by the bill.

Madam Chairman, the Department is continuing its review of the proposed bill and will be happy to provide the Committee with more detailed comments by letter when our review is complete. This concludes my statement, Madam Chairman, and I thank you for the opportunity to appear before you today.

DISCUSSION

Mrs. Lloyd. Thank you very much.

Donna, do you believe, looking at the track record of DOE in the past seven years, does not allow some room for improvement, which is my concern, as you heard Senator Domenici's concern, or the Members of the Committee?

Miss Fitzpatrick. I think that there is plenty of room for improvement. I certainly agree with your view of the Department seven—six years ago. There is no doubt that for historical reasons the Department did not view itself as having an important mission in technology transfer, or it ended up industrial colloboration.

However, since that time, because of some legislation, because of Presidential directives, and because of the directives of the Secretary, the Department has undertaken and directed its contractors to undertake very vigorous activities. And we have seen already the results of those activities.

For example, I think last year we delivered to contractors, or contractors obtained title to 162 patents, which is five times the number of any previous year. In the last couple of years we've had about 90 companies spun off from the laboratories to pursue commercialization of new technologies. The laboratories are receiving royalties for the licensing of the patents which they hold. In 1987, those royalties doubled over the previous year. And for the first six months of 1988, they've almost doubled all of 1987.

So we are seeing very concrete results of the efforts that were undertaken over the last few years, and we would just like the chance to continue to improve those.

Mrs. Lloyd. We are still hearing the horror stories of the good things that are going on in our National Laboratories that they are finding their way to the marketplace by way of Japanese industry.

Miss Fitzpatrick. There is no doubt that the Japanese are extremely aggressive and energetic in getting technology wherever they can find it. It is also true there is an effort to make the results of laboratory research available to American industry. It is done on a very open basis—anybody can walk in and pick up the laboratory reports. And my information is that there are people acting for them in this country, take advantage of that.

But it's important to recognize that they don't have anything that American industry doesn't have. What gets done with it then makes the difference. And I thought about can—is there a way that we can limit information. In general, I don't see how we can make information broadly available to American industry and not keep foreigners from getting hold of it. We can, though, and we are working on ways—and some of the ideas in the bill I think are very constructive—to limit information which arises from particular agreements and activities. And that, I think, would be a very, very important advance, even if only for a short period of time. Industry tells us 18 months to 2 years might be a good time to limit the dissemination of research results to those so that it is held by the company which collaborated in the research and help pay for it, so that they'd get that much of a jump on making use of it.

Those kinds of things are probably possible and desirable. So that's what we're working on.

Mrs. LLOYD. We're turning to another area. Do you think that the Operations Office Manager at the present time has sufficient flexibility but within the detailed policy guidelines and directives from the headquarters to approve these cooperative arrangements in a timely manner?

You see, my concern is not that all this information is out there for the Japanese to grab hold of. My concern is that we're working on technology, the Japanese are working, and other countries are working on it. Ours stays in the laboratory too long and they go with it.

Miss FITZPATRICK. Right.

On the question of whether the field offices have authority to approve agreements, that is another area we identified as needing further work, and that is why the Pilot Centers will have extended authority. We've also encouraged the Office Managers and the laboratories' directors to recognize—as many of them already do—that they have considerable delegated authority right now, and they should be very aggressive about using it.

So part of it—it isn't, as I'm sure you recognize, just a matter of making something legally possible, either through regulation, or directive, or law, it's a matter of giving the leadership and letting people know that's really what we mean; we really want you to do that, and they have been told that—and they're responding very aggressively.

Mrs. LLOYD. I think that Senator Domenici and I both have the same philosophy that you do need a little bit more freedom. So that there will be mistakes made.

Miss FITZPATRICK. That's right.

Mrs. LLOYD. And things are going to fall through the cracks and it's not going to be a perfect situation. But by giving more authority that we can move a little bit quicker and say, hey, a mistake will be made. But it's better to make a mistake along the line than to do nothing.

Miss FITZPATRICK. That is exactly what I personally have told these managers, and the laboratory people have said, we want to err on the side—especially when we're doing something that's in the nature of an experiment—it's the policy of——

Mrs. LLOYD. As I said earlier, I appreciate your leadership and your concern and your enthusiasm.

I want you to comment on the 60-day approval period for the Operations Office Manager to act on these agreements—R&D agreements.

Miss FITZPATRICK. I think 60 days is probably reasonable and sufficient. There's been some talk that it should be longer. In most instances, I don't think it needs to be longer, because what the Operations Office should be aware of the kinds of agreements that the laboratory is thinking about entering into. If people are working together as a team, 60 days is sufficient time.

As a matter of fact——

Mrs. LLOYD. How about 30?

Miss FITZPATRICK. Thirty days, in most cases, would probably be sufficient time since if they were working together the formal application shouldn't arrive at the Operations Office until it's been, in essence, in very good shape and already known that it meets criteria.

But if you shorten it too much, though, you run into a problem with somebody not having time to satisfy himself if there is a problem, that the agreement should be approved—the 30th day comes up and he says, "No", because he doesn't feel comfortable saying yes.

So there's a point of diminishing returns if you shorten the review time. I think 60 days is reasonable and sufficient.

Mrs. **Lloyd**. Well, do you think that the laboratory directors have the flexibility to reward the inventor sufficiently under the existing contracts?

Miss **Fitzpatrick**. Yes, the laboratory contractors have the full discretion, under the Department's guidelines, to fashion their own reward systems and royalty-sharing systems with their employees. The Department is not telling them now to do that and the laboratories, many of them, do have very generous royalty-sharing for inventors.

Mrs. **Lloyd**. Do you think the rewards to individuals should be tied to the royalties for the inventions?

Miss **Fitzpatrick**. I understand that that is generally what is done; they get a percentage share. But as I say, there's not uniformity among the contractors. Some of them already have a corporate policy in those matters, and they are applying their corporate policy.

Mrs. **Lloyd**. I want you to comment on the utility of generic agreements for cooperative R&D.

Miss **Fitzpatrick**. I think they can be extremely useful. And as part of the Pilot Center activities, as I mentioned, we are drawing up generic agreements. I told them I wanted them simple, short, and to the point. I never thought I'd see such a thing, but in fact, our lawyers—who are much maligned—have come up with such a thing.

We are ready to go with generic agreements—standardized agreements—and I think they can be very helpful in speeding the process.

I should tell you, though, that we've had some experience with this in the past where we tried to use standardized agreements and we gave it to a company, and they came back—their lawyers came back with 50 pages of amendments they wanted to make. So it works both ways. But for our part, we're ready to go with meeting that need.

Mrs. **Lloyd**. Nobody ever said it was going to be easy.

Miss **Fitzpatrick**. No, ma'am, nobody said it would be easy. It's not easy, but it is very worthwhile—in fact, I think necessary for the welfare of the laboratories as innovative places where invention can thrive; therefore, it serves the Department's purposes and the Government's purpose in supporting the laboratories. And it's necessary if this information and expertise is going to be a resource to American industry.

Mrs. **Lloyd**. I thank you for your support, for your enthusiasm; and obviously, I thank you for doing your homework.

Miss **Fitzpatrick**. Thank you.

Mrs. **Lloyd**. Mr. Morrison?

Mr. MORRISON. And I want to thank you, too, because I've seen some dramatic changes in the field in the last several years, and we have to presume that that comes back to your credit—so we should give that credit.

I particularly wanted to mention the "Geosafe" in-situ vitrification which is now going commercial—and out of Pacific Northwest Laboratory Battelle—we're really very pleased with that. I think it's a perfect example of an idea that both parties responded to, and has now found it, you know, working its way to helping areas with toxic waste and eventually radioactive waste; so I think that's a classic example.

In the growth that you've seen in technology transfer through what flexibility you've already provided in the Department, do you see this thing snowballing? And a year from now when we meet you will have again doubled, or tripled, or quadrupled the royalties that are coming in, the ideas that have gotten to the marketplace?

Miss FITZPATRICK. I think that there's plenty of room for growth. And as you know, we're growing almost geometrically now, on an annual basis, in numbers of inventions and in royalty income.

I suppose logically at some point it would begin to level out. But I think that there is still probably considerable room for growth. And I understand, when I talk to people in the laboratories, that there's so much enthusiasm where the kind of feedback and the satisfaction that they're getting from seeing their ideas brought to fruition, and also from the royalty income, that they are seeing very rapid increases in the numbers of ideas and patent applications that are being brought in by the laboratory workers.

So I think that we still have quite a few things in the pipeline, and we're going to see continued growth.

Mr. MORRISON. Do you ever worry that we could begin to have that become so attractive that it actually drove the processes within the laboratories?

Miss FITZPATRICK. Yes, and that is why we've always pointed out—as I did earlier—that we must be careful to maintain that the primary mission of the laboratories and their availability for their government mission; and also that we don't want them to become competitors to industry. They must become resources.

I don't think that we want the great resources, funding and facilities, that have been supplied by the Federal Government to be used against, for example, struggling innovative small companies; that is, that they find themselves competing head-to-head with commercial inventions and commercializations coming out of the laboratory against what—they've been doing on their own. So we have to be sensitive to that.

It's one of the risks—part of the risk—of following this course. We should be aware of it and check constantly that that's not happening, but it is not the sort of risk I think that should tell us to keep hands off and simply back away.

Mr. MORRISON. In your experience of the things that so far that have marched toward the marketplace, have they come as a direct spinoff of the intended program, or they just—they come out of the laboratory because you had some great minds there at work?

Miss FITZPATRICK. A great deal of what the Department has been doing for about the last 10 years has actually been consciously intended from the beginning for commercial application. Although the laboratories, many of them, had their genesis in either weapons work or in other work of a basic fundamental nature that the Government wanted to pursue, since the energy crisis of the 1970's, the Department has had the mission of developing technology for commercial application. For example, virtually everything that goes on in the Office of Conservation and Renewable Energy is done not for the Government's purposes and use, but for industry's purpose and use.

Therefore, we have had the conscious research program that said what goes on in the laboratory is supposed to be used by somebody else, and those programs are run that way. So some of it has been a spinoff from what the Government was doing for its own purposes, but a great deal of it was intended to be commercialized from the start.

Mr. MORRISON. I sensed also in your testimony a desire to provide flexibility for the individual laboratories, each one really different in its own way. I recall, Madam Chairman, hearings at Oak Ridge where I was very envious of the model that was in place for technology transfer, and it seemed tremendous progress. It always then looked at my own area at Hanford, presuming that plutonium doesn't spin off very well; but now beginning to see, you know, significant spinoff—and I mentioned "Geosafe" as a classic example.

So I presume that anything we did legislatively, you would still urge us to provide flexibility for each of the individual laboratories.

Miss FITZPATRICK. That's correct. And flexibility for the laboratories and also, as I mentioned, flexibility to work with the many, many different situations that will arise. Companies that come to the laboratories for help have different capabilities and different interests. And, therefore, I'm very wary of legislating, for example, that the laboratories should always get the patent rights, or that they should always have different or a certain level of cost sharing, or anything else of that nature—I think that becomes handcuffs.

And I think that we should be sending a strong message of general principles, for example, that a company that is going to help pay for research should have ready and unchallenged access to intellectual property rights, whether its ownership of the patent or a generous license—to use the patent.

But I think it would be a mistake in a piece of legislation to tie down one particular path, or one particular mode of cooperation, and say that that is what should be done.

Mr. MORRISON. Thank you.

Thank you, Madam Chairman.

Mrs. LLOYD. Thank you.

Mr. Fawell?

Mr. FAWELL. Thank you, Madam Chairman.

You mentioned that royalties have doubled. In terms of dollars and cents, what are we talking about?

Miss FITZPATRICK. In 1987, it was $267,000. The first six months of 1988 have been almost $450,000; and 1987 doubled over 1986.

Mr. FAWELL. You also mentioned something which all of us are aware of, as our Chairman has indicated, the Japanese seem to get in there and ferret out the important and new ideas and walk off with the prize. I don't think we can just blame the Japanese about that. American industry, for some reason, has not been as aggressive or as aware of the opportunities which are there.

But assuming that we have labs who are much more aware of trying to collaborate with industry, will not the Japanese just then also be able to profit correspondingly?

Let me back up and ask the question. Are there any contracts, collaborative contracts, with foreign corporations and entities?

Miss **Fitzpatrick**. I am not aware of any. I can't make a blanket statement that there aren't, and I think I will ask and find out.

Part of the problem, of course, is that it's a little hard to tell what's a foreign corporation anymore. I visited one corporation recently in New York that is a very old American corporation, which does materials work, and is working on some joint projects with us. They are now a wholly-owned subsidiary of a foreign corporation. And a lot of people don't know that because they didn't change their name, but there it is. So it's a little difficult to tell.

But I am not aware that we have any cooperative contracts with Mitsubishi, for example.

Mr. **Fawell**. And yet that probably will be a result. I don't think it's a bad result necessarily, and I don't know—is there any unwritten regulation that say, we're going to ask our laboratories to cooperate and to try to get the word out to industry, et cetera, but, watch out, who owns these companies, and who we're talking to?

Miss **Fitzpatrick**. We would have told them that their mission is to collaborate with American industry; and they don't have to go through three generations of corporate tiers to determine who might actually own a company, or have some influence on it. But we want them working with people who are in America, jobs in America; industry, corporations that at least, for the first tier, are in America.

Mr. **Fawell**. And that's very understandable.

Miss **Fitzpatrick**. Yes.

Mr. **Fawell**. And politically I would have to agree a hundred percent and so forth and so on. But is that a directive of any legislation of which you are aware?

Miss **Fitzpatrick**. I am not aware that there are any legislative restrictions. It's just something that we share your sensitivity to. And we have a general policy in the Department that when we colloborate, as we very often do, with other countries, or with corporations in other countries, that it is for good reason, with strong mutual benefits. And, of course, we have under the International Energy Administration a great many collaborative international projects—many of which the laboratories participate. But those are always nation-to-nation agreements.

I am not aware, and we would be very sensitive toward any individual contracts with a foreign corporation to make use of the resources of the National Laboratories unless we had a good reason—they had something that we wanted too, and that can also have a——

Mr. **Fawell**. Yes, I could imagine some potential unique lawsuits of discrimination and so forth and so on. But maybe that's something we'll have to be thinking about in terms of legislation.

In your opinion, why are the Japanese so able to ferret out and to utilize these unique ideas which come about through our prime concern of researching? And why does American industry sit back as—as they seemingly have done—and are outcompeted here?

Miss **Fitzpatrick**. Well, Congressman, I can only offer my personal opinion. One is, the Japanese work very, very hard. They have both a national culture and a corporate culture, which causes them to work very, very hard. So they are very energetic and aggressive.

Number two, they are willing and naturally able to make long-term investments. The cost of capital in Japan is only about a third of what it is in the United States. That means they don't have to look for rapid payback. Their interest rates are considerably lower.

They also have corporate structures in which banks very often sit on the boards of the manufacturing corporations; therefore, they have a very close relationship between their sources of capital and the manufacturing corporation. And that means that there's a great deal of trust and cooperation in that respect.

All of these things have been pointed out by other people, but I think that they are salient points and I think that there's something perhaps we should think about, especially if you consider that our tax policy in some cases encourages shortsightedness on the part of U.S. investors. And perhaps Government can't force people to be longsighted, but I would think that we wouldn't want to be doing things to encourage them to be shortsighted.

Mr. **Fawell**. Well, it is an area of concern.

Mr. **Morrison**. If the gentleman would yield, I have an excellent capital gains tax bill that you may want to go on—it will answer part of your question.

Mr. **Fawell**. Well, I think I might be interested in something like that, because the cost of capital is quite high. But there are those cultural differences, and I just simply point out in my closing comments that perhaps we can, as Members of Congress, and yourself in your capacity in DOE and other agencies, can do all kinds of things to blow the bugle, so to speak, to try to get American industry interested—and they still may be lethargic about this—for all of the cultural and other reasons to which you've made reference.

Miss **Fitzpatrick**. Well, I'm afraid that we have actually had experience with going to companies and saying, we developed this particular technique, or this instrument that can help you detect faults in your manufacturing, or something like that, and we got a shrug. They're not overly enthusiastic about making the necessary investment. Even just to buy something that's already developed and install it in their assembly line. It's very discouraging sometimes.

Mr. **Fawell**. And I don't mean to discourage this bill.

Miss **Fitzpatrick**. No.

Mr. **Fawell**. I think anything we can do to prod American business to move into action, and anything you can do, but I sometimes wonder about the——

Miss **Fitzpatrick**. I think——

Mr. **Fawell** [continuing]. The great hard work of American industry—a reputation we've always felt we had—and where it is these days.

Miss **Fitzpatrick**. I think your points are very well taken. And although we can't guarantee success, and guarantee that industry will take everything that's available in the laboratories, we still have to be doing our part to make sure that it's available and that there aren't any unnecessary barriers to their coming and getting it.

Mr. **Fawell**. All right. Thank you very much.

Mrs. **Lloyd**. Thank you very much, Mr. Fawell.

Mr. Stallings?

Mr. **Stallings**. No questions.

Mrs. **Lloyd**. Donna, I'd like to go back to the DOD—the DOE defense programs—pardon me. I think they're certainly a valuable source of applied technology and I do want to commend Troy Wade for his leadership, and his enthusiasm, and his constructive attitude toward technology transfer. As you know, I was able to get language in the DOE bill to move nonclassified programs which we hope can get to the marketplace—to place a burden for denying the DP patent waivers on the Secretary of Energy.

Would you like to comment more on this in addition to what you have on your testimony?

Miss **Fitzpatrick**. Yes, Defense Programs has been very enthusiastic in recognizing that they also have a very large contribution to make for technology transfer. Mr. Wade has directed, and is beginning to implement, a technology transfer program within the Defense Programs. And I must say there's no zealotry like the zealotry of a convert because some of his people have become quite enthusiastic. And it's a whole new area for them, and they're learning, but I think that they have carefully integrated their efforts with the rest of the Department so we don't have conflicts. They sit on all the committees just like everybody else, and I think they're making great progress.

Mrs. **Lloyd**. I'd like to turn to the Naval Reactor Development program which has been referred in these circles as the black hole of the technology transfer. [Laughter.]

Is there any hope that any of these activities are going to come out of that area? It seems to be an area where no advance civilian technology can get in or out.

Miss **Fitzpatrick**. I'll have to admit that I'm not as personally familiar with that particular black hole as with some of the others. And apparently there is a great deal of sensitivity, as I'm sure you're aware, about those dedicated laboratories. They are not really part of what we usually think of as the National Laboratory system. They have a very specific mission to perform. They're very sensitive about performing that mission efficiently and with a singlemindedness that is commendable; but I am quite willing to discuss with them the possibilities of their also contributing and thinking about what they have learned that might not be available elsewhere that could be useful to industry. I think that——

Mrs. **Lloyd**. In no way do we want to jeopardize the national security. We are all aware of the implications of doing so, but at the same time, I think this is just an unrealistic environment. And I think that it's time that a little bit of emphasis be placed in this area and say, hey, look, we think you can do better.

Miss **Fitzpatrick**. Well, I think your point is well taken.

Mrs. **Lloyd**. Thank you very much. Thank you, Donna, we really enjoyed having you with us this morning.

Miss **Fitzpatrick**. Thank you, Madam Chairman.

Panel 1

Mrs. **Lloyd**. Our first panel of National Laboratory Directors include Dr. Alexander Zucker, who's Acting Director of Oak Ridge National Laboratory; also Dr. Harvey Drucker, who is Associate Director of Argonne National Laboratory, and Dr. Seymour Baron, who is Associate Director of Brookhaven National Laboratory.

Of course, Dr. Zucker is very well-known to me and to this Subcommittee. He is certainly an adviser to this Member of Congress. He is one of my constituents, and I'm sure he'll tell us how to improve the bill. We look forward to his testimony at this time. Please proceed.

STATEMENT OF DR. ALEXANDER ZUCKER, ACTING DIRECTOR, OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN

Dr. **Zucker**. Thank you, Madam Chairman, Members of the Committee.

I admire your initiative to present in a single bill a large number of measures to help overcome the barriers that currently impede effective working relationships between our National Laboratories and American industries in their effort to return America to its leadership role in international commerce.

Speed is essential. Legal arrangements, collaborative agreements, licensing agreements, and patents, all must be done rapidly—highly competitive, multinational industrial setting. The industrial concern has many options and many constraints. It is not likely to take a course when negotiations and red tape are measured in months rather than weeks.

Our technology now moves from R&D to marketing in two or three years. A contract negotiation takes a year. Who can blame an industry if its interest lags?

Fortunately, the draft legislation you propose addresses several of the factors that currently contribute to delays in the establishment of agreements and contracts between the National Laboratories and industry.

We recognize that generic agreements, terms and conditions that do not require additional review after they have been accepted by DOE, could be extremely beneficial to our programs. These agreements must, however, follow current industry standards. They should not include requirements for advanced payment, and the liability and indemnification clauses should follow current industry practice.

I'll cite a recent example where an IBM contract came to us and was four pages long. We sent back something that was acceptable to us—it was 17 pages long. There is no need for that.

I welcome the extension of the definition of laboratory in the Stevenson-Wydler Act to include performance of research, development and engineering by nongovernment employees of a contractor of DOE. The limitation of the definition in current legislation to Government employees has frequently caused difficulties for the contractor-operated National Laboratories.

Protection of intellectual property rights for technical data, including experimental results, engineering drawings, software, et cetera, is another important key to successful interaction with industry.

I commend your inclusion of this sensitive but essential issue in your bill; it is usually left out. Competitiveness in every market depends on the protection of intellectual property. Industries will not work with the National Laboratories if their competitors can gain access to their data. We have to balance that requirement very carefully with the requirement that scientific results be promptly communicated to the scientific community, and not tolerate in this country the arrangement where scientific acts are held from the scientists who need them.

Your proposed modifications to the Federal Non-Nuclear Energy Research and Development Act are also timely and important. I am personally pleased to see legislation that can lead to the realization of our proposal that our Nation's Laboratories serve our country as technological commons, freely accessible institutions and facilities to serve American industry in its quest to regain leadership in global commerce.

I further hope that you and your Committee will continue to oversee these matters as they change and develop. Your insight and assistance are important to maintain the progress and the momentum we have established in this area.

Before closing I would like to comment on one very recent Oak Ridge invention—I usually try to do that. And our engineers have designed a tiny prototype silicon microchip that transmits infrared laser signals. Each microchip weighs about 35 milligrams and contains its own array of solar cells for power. With a chip attached to the back of a killer bee, the bee can be tracked and monitored with ground receivers. A patent application for this development has been filed by DOE and an invention waiver has been requested by us. The potential applications of this microchip are limited only by our imagination. In addition to the potential savings in the agricultural industry, applications range from toys to sensors for national security and defense.

I've brought with me a picture of such a bee you might like to have—it has its own transmitter.

[Photo distributed to Members.]

Mr. MORRISON. I'm sure that one of those applied to your children might be helpful as well. [Laughter.]

Teen-agers especially.

Mrs. LLOYD. That's 1/60th of an ounce. That weighs 1/60th of an ounce?

Dr. ZUCKER. Thirty-five milligrams. It's a 30th of a gram.

Mrs. LLOYD. Limited only by our imagination. It's exciting, very exciting.

Dr. ZUCKER. Bees can carry, I'm told, 47 milligrams, so we're——

Mrs. LLOYD. We appreciate you sharing this with us this morning.

Dr. ZUCKER. Thank you very much.

That completes my prepared statement.

Mrs. LLOYD. Thank you, Dr. Zucker.

[The prepared statement of Dr. Zucker follows:]

NATIONAL COMPETITIVENESS ACT OF 1988
TITLE 1. TECHNOLOGICAL COMPETITIVENESS MEASURES

Alexander Zucker

Acting Director

Oak Ridge National Laboratory

Testimony Before the

Subcommittee on Energy Research and Development

Committee on Science, Space, and Technology

July 27, 1988

TESTIMONY

NATIONAL COMPETITIVENESS ACT OF 1988
TITLE I. TECHNOLOGICAL COMPETITIVENESS MEASURES

SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT
COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

July 27, 1988

Good Morning. I am Alexander Zucker, the Acting Director of the Oak Ridge National Laboratory. I appreciate the opportunity to comment on the Draft Bill proposed by Congresswoman Lloyd. I admire your initiative to present in a single bill a large number of measures to help overcome the barriers that currently impede effective working relationships between our national laboratories and American industries in their effort to return America to its leadership role in international commerce.

Interactions with industry are important to ORNL. We have worked very hard to transfer technologies developed by our scientists to American industries for commercial production. Last year, over 600 of our industrial colleagues worked with ORNL staff at our User Facilities and in our laboratories on research and development projects including high performance alloys, toughened ceramics, high temperature superconductors, semiconductors, robotics, artificial intelligence, microelectronics - projects covering virtually the full spectrum of high technology activities.

Although we have been successful in these and other areas of industrial interactions, the successes have been hard to come by and excruciatingly slow.

There is so much more we can and want to do. As you are aware, there are many obstacles to successful and meaningful interactions with industry. Speed is essential. Legal arrangements, collaborative agreements, licensing agreements, patents: all must be done rapidly in a highly competitive multinational industrial setting. An industrial concern has many options and many constraints; it is not likely to take a course where negotiations and red tape are measured in months rather than weeks. High technology now moves from the R&D phase to marketing in 2 or 3 years. If a contract negotiation takes a year, who can blame an industry if its interest flags?

Fortunately, the draft legislation you propose addresses several of the factors that currently contribute to delays in the establishment of agreements and contracts between the national laboratories and industries. You recognize that generic agreements, terms and conditions that do not require additional review after they have been accepted by DOE, would be extremely beneficial to our programs. These agreements must, however, follow current industry standards, e.g., they should not include requirements for advanced payment, and the liability and indemnification clauses should follow current industry practice. The reduction of the paper burden on our legal staffs, both at the laboratory and at the operations office, could significantly speed the processing of nongeneric agreements. The 60-day period for approval/disapproval of nongeneric agreements that you propose is the goal that ORNL and our operations office have been working to attain.

The time required to have DOE approval of the transfer of property rights for patents from DOE to the operating contractor is a problem faced by all of the national laboratories that currently do not have the privilege of automatic transfer of such rights. Over the past year, DOE has reduced the approval times for the majority of cases to 90 days or less. Your proposal of a 90-day limitation for DOE disapproval of the transfer of these rights would succeed in mitigating any remaining delays in the procedures. Additional confusion remaining in this arena would be eliminated with clarification of the grounds for disapproval of the transfer of the rights.

I welcome the extension of the definition of laboratory in the Stevenson-Wydler Technology Innovation Act to include performance of research, development, and engineering by non-government employees of a contractor of DOE. The limitation of the definition in current legislation to government employees has frequently caused difficulties for the contractor-operated national laboratories, such as Oak Ridge National Laboratory.

Protection of intellectual property rights for technical data, including experimental results, engineering drawings, software, etc., is another important key to successful interaction with industry. I commend your inclusion of this sensitive but essential issue in your bill; it is usually left out. Competitiveness in every market depends on the protection of intellectual property. Industries will not work with the national laboratories if their competitors can gain access to their data. The protection of data has been an issue in numerous discussions with the industrial advisors to our User Facilities. This is a particular concern for the American ceramics industries that want to use our High Temperature Materials Laboratory. Your legislation provides mechanisms to protect technical data for a reasonable time while not removing the essence of the open nature of work performed at the National Laboratories.

Through the Superconductivity Pilot Centers program, DOE, the local operations offices, and the three national laboratories with pilot centers, have also been working to define technology transfer problems and to find solutions. The legislation that you propose, Congresswoman Lloyd, is complementary to these efforts. I am encouraged by the unity and enthusiastic cooperation among these groups in the effort to solve our common problems.

Your proposed modifications to the Federal Nonnuclear Energy Research and Development Act are timely and important. Implementation of these policies would promote successful interactions between the national laboratories and Industries - a goal shared by the laboratories, DOE, Industry, Congress, and the American taxpayer. I am personally pleased to see legislation that can lead to the realization of my proposal that our nation's laboratories serve our country as "Technological Commons," freely accessible institutions and facilities to serve American industry in its quest to regain leadership in global commerce. I hope that you and your committee will continue to oversee these matters. Your insight and assistance are important to maintain the progress and the momentum we have established in this area.

The language in the Cooperative Research and Development Agreements: General Authority section [Sec. 103, (o) ,paragraph (2), (B)] was not clear to me. May I suggest the following language for (B): Require each contractor to delegate all authorities and responsibilities under this section to the Director of each laboratory.

Before closing, I would like to comment on one very recent ORNL invention that will profit from increased technology transfer awareness. Our engineers have designed a tiny prototype silicon microchip that transmits infrared laser signals. Each microchip weighs about 35 milligrams and contains its own array of solar cells for power. With a chip attached to the back of a "killer bee," the bee could be tracked and monitored with ground receivers. A patent application for this development has been filed by DOE and an invention waiver has been requested by us. Our first discussions with interested companies are taking place this week. The potential applications for the microchip are limited only by our imagination. In addition to the potential savings in the agricultural industry by combating the killer bee problem, applications range from toys to sensors for national security and defense.

Mrs. LLOYD. We're also delighted to have Dr. Harvey Drucker. We're looking forward to your views on the legislation on technology transfer. You may summarize or proceed as you wish.

STATEMENT OF DR. HARVEY DRUCKER, ASSOCIATE LABORATORY DIRECTOR, ENERGY, ENVIRONMENTAL, AND BIOLOGICAL RESEARCH, ARGONNE NATIONAL LABORATORY, ARGONNE, IL

Dr. DRUCKER. First of all, it's very, very tough to follow someone who shows a picture of a killer bee carrying a microchip. [Laughter.]

We do not have at Argonne a picture of a cockroach carrying a cannon, unfortunately.

Our written text covers specific comments on the bill. I would like to take this opportunity to respond to a question that Representative Lloyd and Representative Fawell asked us about eight months ago—asked the group from Argonne that were visiting.

He said, "How do we make sure that we're fair relative to dissemination of intellectual property of the broadest group of American users, and at the same time, make sure that those users are capable of developing specific intellectual property they can protect at National Laboratories?"

In the past few months, essentially because of the Pilot Centers and superconductivity, we've been really working on getting an answer to that question. I'd like to tell you what Argonne's answer is here because I think it's germane to this Committee.

We believe that we have in place a two-track system for the development of intellectual property that really provides the answers to your question.

Intellectual property comes in two flavors, if you will—base and specific. Base intellectual property tends to be generic—covers a lot of different things. We want, if at all possible, available to the broadest base of potential users; I should say, really, owners. We can do that by publishing our base results in literature and providing through license patents and data.

It tends to have very high scientific value. The scientific community will tell you this is of something of use. The commercial community is really not clear on what its use will be.

My favorite example of this is the laser. Up until really very recently—the early 1980's—the principal use for laser technology was inventory control in supermarkets. I doubt greatly that the inventors of the laser had in mind maintaining an adequate supply of soap chips in supermarkets—that really was the most important commercial use.

Base intellectual property normally is developed by investigators who want to publish any open literature, get professional recognition. And now, because of changes in our present procedures and protocols, they occasionally would like to be financially rewarded for the development of base in intellectual property results in patents.

What we would like to do with this base information, and what we are doing with this base information, is license it to as many people as possible—as many American companies as possible. The model for this license is the Cohen-Boyer patent. For those of you who may be unfamiliar with that, that is the base patent for bioengineering. It's owned by Stanford University. They made a conscious choice to give this to the broadest group of users possible. All you have to do is pay a small fee for its use in the laboratory—that's really what you're talking about. And then if you build a product on it, to pay a royalty.

The net result has been a lot of companies making a lot of products, and a lot more in the future.

The second tier is development of specific intellectual property. That's a different can. Such property is proprietary. It tends to be owned by a particular company. It tends to be funded by the private sector, and clearly, it has commercial value. It's worth something. Normally, it has been our experience that the funder wants to own it in toto. And what he intends to do is to use it to make specific products and processes.

The process that we're referring to, these two tiers here, are of some value to a laboratory—or some value to an inventor—in that they encourage the laboratory to get involved in specific process or product development.

Your base intellectual property is really not worth very much unless you're capable of converting it into specific items of commerce. And that we believe, and we've seen evidence of that in biotechnology—we've seen evidence at our own lab—is a large driving force behind getting inventors involved in the process of development of specific intellectual property, behind getting laboratories involved in such development.

What will it take to do this? Well, part of what it will take to do this is in your bill. A lot we can presently do. There is a fair amount—at least at Argonne, that we can do with our current authorities. What we are proposing is not only doable, it does the following: we believe it protects our right to publish, which is very important for our staff. It rewards processes of basic invention. It accommodates—and that's the reason why we did it—both the generic needs of technology development and the specific needs of technology development, and it represents a natural flow of generic to specific technology.

In order to do this, all the labs need—and we've got this in large measure, but others don't—is a fast-track waiver for patents; the ability to protect data and know-how for some period of time—not to have to reveal it publicly—and a bit of education, both on the part of our staffs, tell them that this is something we want them to do, and I think the record shows, at Argonne, anyway, that that education is proceeding exceedingly well; and a bit of education as far as industry is concerned. I think again, we think the record precedes there—seems to show that that is proceeding very well.

Thank you.

Mrs. Lloyd. Thank you very much, Dr. Drucker.

[The prepared statement of Mr. Drucker follows:]

Testimony Before the

SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT OF THE HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

ARGONNE NATIONAL LABORATORY • UNIVERSITY OF CHICAGO

by

Harvey Drucker
Associate Laboratory Director
Energy, Environmental, and Biological Research
Argonne National Laboratory

July 27, 1988

Our thanks for this opportunity to comment on the draft "National Competitiveness Act of 1988". In general, the Bill addresses some key issues that must be dealt with if technology transfer from national laboratories to U.S. industry is to be optimal. An underlying concern of the Bill is the perception that the DOE approval processes in technology transfer are unnecessarily slow and cumbersome and can be improved by greater delegation of approval authority to the field offices. Argonne is in the fortunate position of no longer having to request patent waivers from DOE (save for statutory exemptions, we have title to our patents). Thus, there is no delay for the University of Chicago and its affiliate, the ARCH Development Corporation, in obtaining ANL patents. In addition, we have excellent relations with the DOE Chicago Operations Office on most of the matters--legal, contractual, financial--surrounding technology transfer.

All of the above indicates that present legislation and practice in technology transfer, as it relates to the operation of Argonne National Laboratory, seems, overall, to serve its function.

The following are more specific comments, not in order of priority:

1. We would agree that the National Energy Software Center (NESC) may not be an appropriate vehicle for the development of commercial software based on DOE funded R&D. The record should note, however, that, historically, this has not been NESC's mission. Rather, NESC was meant to quickly get software into users' hands ready for their use in basic research and for the operation of energy-producing facilities. There is little doubt that it has performed these functions well. We are not aware of any commercial benefit to foreign firms derived from NESC's operations on these missions. There is also little doubt that it is time for a DOE software policy that will attract U.S. industry into licensing such software. We do not believe that present copyright policy on software is adequate in this regard.

2. We agree that industry must collaborate with the national laboratories early in the R&D process, perhaps at the basic research stage, in order to detect new products and processes that can be based on the research. For this to be done in an equitable manner (to provide access to a large base of potential commercial users--large and small), we sense that exclusive relationships should occur only when it is clear that the research can be converted into useful processes and products.

3. We agree that there is a strong need for the DOE laboratories to be able to enter into collaborative R&D agreements with the broadest range of people and corporations. However, our experience suggests that the implication of such collaboration with regards to ownership rights in intellectual property generated under such agreements must be carefully articulated (ideally, early in the course of negotiation on the collaboration), leaving no room for misunderstanding.

4. We disagree with the proposal to grant, as a general rule, advance options for license or assignment or property options to collaborating parties. We feel that such options should be decided in the course of negotiation between all parties, rather than in advance of discussion. Present practice, which we have used in the development of workable agreements, assigns property generated by the Laboratory under federal funds to the Laboratory contractor or to DOE, assigns property generated by the corporate participant to that participant, and subjects joint inventions to negotiation. We think that this practice prevents a specific company from taking blanket ownership of property for relatively insignificant sums of money and then using such ownership to block competitors from entering the particular field of technology.

5. Relative to Page 8, paragraph (3), we would add this phrase to the paragraph after the phrase "in the service of the National Laboratory": "said efforts consistent with the Laboratory's existing specific programs/projects/agreements/practices in technology transfer."

6. We believe that a 60-day period for approval of agreements may be too long. We would suggest that a month might be appropriate.

7. We agree that a 20% cap on Laboratory funds to be used in cooperative agreements may generally be appropriate. We can see that there might be special circumstances where, over some finite interval of time, this cap, in the national interest, would be properly exceeded.

8. Relative to Page 11, item (u)(5), it is not clear what personal benefit means in this context. Obviously, per the Bill's text, using derived funds for purposes of the institution (R&D, education) would not fall under this definition. We would suggest, for complete definition, that the Bill include some statement allowing the contractor to defray administrative costs associated with marketing, patent processing, and activities associated with development of licenses or collaborative agreements.

9. Relative to paragraph v, Protection of Property, our evidence to date suggests that loss of relevant data through FOIA requests may not be a serious problem. However, it is perceived as a serious problem by industry and thus some steps allowing the Laboratory to protect data where appropriate might be of use.

10. The issue of definition of "domestic entity", Page 14 item (6), remains. Is a company owned by a foreign company, but primarily managed from the United States, and meeting all other criteria of the Bill's definition, a potential "third party"? We know, offhand, of at least two companies that fit this description. That is, their primary research and development and production facilities are in the United States; decisions on R&D, marketing, and production, etc. appear to come from American management.

Title II, National Superconductivity Program

In general, we agree that a five-year national program in superconductivity might be desirable, providing that it carries adequate funding and both technical/procedural flexibility commensurate with the needs of technology transfer. In this regard, it is not clear to us how this program would be coordinated, given the large cast of agency, laboratory, and industrial participants, and how each sector involved in the process of technology transfer would impact technical program and procedure. Federal agencies, like laboratories and industry, are not excellent prophets of the commercial future. Perhaps three or four crystal balls are needed, with provision for adequate viewing by all.

1. We are not sure why Department of Defense, in particular DARPA, is omitted from the list of agencies working on superconductivity.

2. On Sec. 207, International Cooperation, we believe that the laboratories need guidance on requests for collaboration in applied superconductivity from foreign-owned companies. To date, the best guideline appears to be that it is legitimate to collaborate with foreign-owned companies that are primarily American managed, and perform substantial manufacture and R&D in the United States. This title does not appear to provide such guidance.

Mrs. **Lloyd.** Certainly we welcome Dr. Sy Baron. We go back to Clinch River days when we fought the battle of Clinch River. It's just a real delight to have you with us this morning. Please proceed.

STATEMENT OF DR. SEYMOUR BARON, ASSOCIATED DIRECTOR, APPLIED PROGRAMS, BROOKHAVEN NATIONAL LABORATORY, UPTON, LONG ISLAND, NY

Dr. **Baron.** Thank you. Thank you very much, Madam Chairman.

I've submitted my written testimony and I'll just make some comments, some high points about the testimony.

As you indicated, I work with industry; in fact, I spent about 35 years in industry working with utilities and process companies, so I have a pretty good idea what the industry attitudes are as far as working with national labs.

Bringing up Clinch River, Madam Chairman, I think hits the nerve of why industry has problems with the Government, because the Government has not been historically a reliable collaborator. Utilities put in a lot of money in Clinch River. Many companies, during the need to develop solar energy, were formed to try to develop the solar market and the laws changed and fell by the wayside. So if industries are not rushing in to grab our technology, I think that's because there's been a pretty poor track record of collaboration.

I think what your bill is trying to do is to ease them back into the idea—we're trying to give them confidence that things will work and I think that is what's very positive about the bill and in many areas about the bill that we like.

Of course, as you know, there's also been a bad track record on intellectual property in the past. And I think what you're trying to do there is also very constructive.

The—we like the bill. We think it's—it will help ease the access of industry to the National Labs. We like the idea of trying to collaborate with industry in developing R&D programs. We like the idea of the agreements being pushed in a very timely way.

The idea of having a generic agreement gives us some problems in the sense that we have had standard agreements that we have given to industry to work with us. And as was mentioned—I think by Alex or Donna—what happens is industry has their lawyers and they take these standard agreements and they have their own style and their own liabilities and change the agreements. So this has not worked for us.

We do have, as a National Lab at Brookhaven, permission to procure up to a million dollars of fixed price contracts; and cost-plus contracts about a quarter of a million dollars. We have that authority from DOE. We'd like to suggest that maybe the bill be crafted to essentially give the National Labs a level of funding that they can negotiate rather than having to work with a generic agreement. And I think that would be something to consider as a way of easing the process.

The—we believe that both we have the authority—the lab director and the local field office—have the authority and responsibility to approve our agreements. Our main concern is that in any generic arrangement, that Headquarters doesn't limit the flexibility of the local office. I think the local office can do it, but we'd be worried about new policies and procedures that would actually restrict their flexibility, and we'd be concerned about that.

The other areas—some word crafting we'd like to suggest—I think Alex brought it up—the protection of property. The bill works very diligently and properly to—for the concerns of commercialization, but most of the laboratory work is basic science and a lot of applied science that may not have commercialization, and the ability to publish readily and quickly should not be inhibited by the same concern to protect commercial information. And I think some word crafting would be needed to make sure that isn't—that's not a negative aspect of the bill.

The—the other area that we would like to raise is the standards of conduct. Each lab has its own policies and procedures on ethics and standards of conduct that's in their agreements. And I think this would be a better one than a generic standards of conduct which may overlay the one we have and raise more problems than actually solve the issue.

And another word crafting thing would be in compensation. It isn't clear, but we would assume that the royalties that do come back to the M&O contractors are not given back to DOE to help fund their—or to back up their R&D support—that it actually goes to the M&O contracts to help their tech transfer and to continue to work in that area. And we would hope that that issue doesn't fall out as misunderstanding of the bill.

I'm—in general, we like the bill. I think it's going to go a long way to ease some of the industry people back into the fold, and we would be very happy to answer any questions you might have.

[The prepared statement of Dr. Baron follows:]

Testimony by Brookhaven National Laboratory
Before the Subcommittee on Energy Research and Development on the 1988 Proposed National Laboratory Competitiveness Act

July 27, 1988

My name is Sy Baron and I am the Associate Director at Brookhaven National Laboratory, responsible for the Laboratory's activities in applied programs. In this capacity I am responsible for the Laboratory's Department of Nuclear Energy, the Department of Applied Science, and Technology Transfer. I have attached a resume of my educational and professional experiences, which includes almost thirty five years in industry and the last three-and-a-half years at Brookhaven National Laboratory. During my industrial career, I was responsible for designing and building power plants for the electric utility industry, processing plants for the chemical and pharmaceutical industry, and a variety of energy systems and new technology projects for the AEC and DOE.

The Laboratory management considers technology transfer an important part of its mission and we have been actively pursuing a variety of approaches with some success. The proposed bill makes a positive contribution to the national goal of increasing our competitiveness by easing industry's access to our National Laboratories by fostering collaboration in the science and technology available at our National Laboratories and by ensuring timely consideration of agreements.

We endorse the objective in the bill of creating a class of cooperative research and development agreements which are not subject to further Department of Energy approval. We do not believe that the bill's mechanism of requiring an unmodified generic agreement to satisfy this requirement will accomplish the stated goal. We have had DOE approved forms of cooperative research and development agreements for the past several years but unfortunately third-party sponsors of work are not willing to accept them unchanged. As a management and operating contractor, we are currently authorized to enter into contracts in the procurement area without further approval provided such contracts are below threshold dollar amounts. We have been very pleased with this mechanism and would suggest it as an alternate approach in the cooperative research and development arena.

The delegation of authority to the field office manager called for in Section (2) (A) currently exists in our relationship with the Department of Energy. However, the flexibility of such a manager can be greatly restricted by orders and detailed directives issued from Washington with regard to cooperative research and development agreements. The requirement in Section (2) (B) that all authorities and responsibilities at the contractor level reside in the Director of the Laboratory, does not present a problem.

We are in agreement with the principles contained in paragraph (3) authorizing the National Laboratory to negotiate agreements although we are somewhat confused with the language addressing "any property voluntarily assigned by National Laboratory employees." We do not fully understand what this phrase is seeking to address or accomplish.

We approve of the specific authorities provided in Section 103 (p). Our only concern is that the requirement of consistency with Department of Energy "standards of conduct" set forth in Paragraph (3) is too vague. Under our contract with the Department of Energy, we are required to have in place policies and procedures governing the proper conduct of our employees. These policies and procedures must be satisfactory to the field office manager. We would therefore recommend that paragraph (3) be modified to reflect that the standards of conduct are those of the management and operating contractor.

We view favorably the mechanism for the approval of agreements set forth in Section 103 (q). However, once the process has reached the stage where a definitive agreement is being submitted to the Department of Energy for approval, we would recommend that the time frame in this section be shortened from sixty to thirty days.

The technical data provisions in Section v, Protection of Property, could appear to stifle the free flow of scientific information, which is the cornerstone of basic research and applied programs like those conducted at the National Laboratories. We would suggest that these provisions be crafted to address the commercial concerns while still recognizing the importance of timely dissemination of scientific information.

We do not understand Section (w) (3) on compensation involving National Laboratory contracts. This section could be interpreted to provide DOE a basis for recoupment of R&D costs which would greatly reduce the availability of royalties for use in supporting technology transfer at the Laboratory and for providing seed money for new exploratory research efforts at the Laboratory.

This summarizes the key points on the proposed bill. The full details of our comments of the bill have been separately submitted. We believe this bill will aid our industries' competitiveness domestically and internationally.

May, 1988

Biographical Information
Seymour Baron

As Brookhaven National Laboratory's Associate Director for Applied Programs, Dr. Baron has responsibility for the research programs of Brookhaven's Departments of Applied Science and Nuclear Energy, applied programs in other departments, and the Office of Research and Technology Applications. These activities encompass a staff of over 500 scientists, engineers, technicians, and other professionals. As Associate Director, he is involved in development of programs with the Department of Energy, Department of Defense, and other Government agencies as well as many industrial firms and utilities that support and collaborate with Brookhaven National Laboratory. He is also actively pursuing programs to transfer technology developed in the laboratory to the industrial community in order to improve the U. S. industrial competitiveness.

Before joining Brookhaven in 1984, Dr. Baron was Senior Vice President of Burns and Roe, an architectural engineering company. He was appointed Vice President of Engineering of Burns and Roe in 1964, and in 1973 was named Vice President of the company's Breeder Reactor Division. In 1975 he was elected Senior Vice president for Engineering and Technology. In 1978 Dr. Baron was given additional responsibility as Vice President of the Power Technology Division.

Dr. Baron is a member of the National Academy of Engineering and is active on the Academy's Peer Review Committee. He is a fellow of the American Society of Mechanical Engineers, a fellow of the American Nuclear Society, a fellow of the American Association for the Advancement of Science, and a member of the American Association of Engineering Societies.

He was also a member of the National Society of Professional Engineers' Three Mile Island Review Committee, and a member of the Review Committees of the University of Chicago's Special Committee for Reactor Development, Chemical Technology Committee, and the Special Committee for the Fusion Program at Argonne National Laboratory. He was a commissioner of the New Jersey Commission on Radiation Protection and served for seven years on the Argonne University Association's Board of Trustees.

He was a U. S. Representative to the Sixth Nuclear Congress, CNEN, Rome, Italy; Nederlands Atoomforum, Utrecht, Holland. Adjunct Professor, Columbia University and Polytechnic Institute of Brooklyn. Member of U. S. Delegation to Russia on Fast Breeder Exchange. Testified frequently before U. S. Congressional Committees on energy matters.

He was graduated from Forrest Park High School in Baltimore before enrolling in Johns Hopkins University, where he received a B.S. degree in chemical engineering in 1944. He received an M.S. degree in chemical engineering from Johns Hopkins in 1947, and a Ph.D. degree from Columbia University in 1950. He also studied at the Argonne International School of Nuclear Science & Engineering, Argonne, Illinois, in 1956.

Dr. Baron is the author of more than 75 published technical papers on all aspects of energy R&D and its commercial applications. He is a Registered Professional Engineer in New York, New Jersey, California, Florida, Washington and Tennessee.

PANEL 1 DISCUSSION

Mrs. **Lloyd**. Thank you very much.

We do hope to move on this bill rapidly and try to get it out before the end of this session of Congress. It's something that's need and I'm certainly delighted to have your support this morning and also your comments as how to make it a little bit better.

Dr. Baron commented on the rule that run the generic agreements, whether or not it needed further clarification.

Do you want to comment on that further, Alex?

Dr. **Zucker**. There are usually negotiations required, but if you can have large chunks of an agreement to be generic, that helps a lot.

Our experience has been that the problems that arise usually have to do with the indemnification and liability problems. And that I've heard it said by one of our lawyers that if somebody gave us a contract of the sort that we're asking them to sign, he wouldn't allow us to sign it. And that's a quote.

Now we should develop our contracts in the spirit in which industry works in general and not try to inhibit the connection.

The biggest problem that we have had is not actually in the patents or in the work or in science; it has to do with liability and contractual—and essentially liability questions.

Mrs. **Lloyd**. So just giving you an increased level of funding would not necessarily solve your problem?

Dr. **Zucker**. No, it wouldn't.

Mrs. **Lloyd**. Would you like to comment on that, Dr. Drucker?

Dr. **Drucker**. Our experience to date has—well, let me start off by saying that I would prefer the use of model agreement rather than generic agreement, largely because our experience to date says that every time we work with industry—and we've now done a fair amount in the past two years, got a fair number, oh, we've got something like five licenses given out this past year.

We find that every time's a new time. Different companies want different things, even in terms of very basic things, such as agreements relative to liability.

If we can say, okay, this is what an agreement looks like—these are the bases for negotiation, these are the degrees of flexibility. We can give them the scope of the ballpark, if you will, in a model agreement. That's very useful.

To give them the sense that, okay, here's a piece of paper; if you can't fill in the blanks you can't play with us—would be a very, very dangerous thing to do.

So, to my mind, rather than use the term "generic," I would prefer the term "model" and I would like to see us, anyway—based upon experience—have sufficient enough flexibility that we really can fill in the blanks.

Mrs. **Lloyd**. That's very good.

Sy?

Dr. **Baron**. One reaction. We were visited recently by an industry representative who wants to work with Brookhaven—and his comment to me is, don't send me an agreement because I'll never get it through my operations; send me a bill and I'll send you the money. And there is a concern of moving the process along on some of these agreements.

We've had a lot of trouble. We've had these model and standard agreements and it's almost impossible to get a resolution in a timely way as far as proceeding on it.

Mrs. LLOYD. Well, obviously, we, in crafting this bill, we want something that is relevant, something that does work; and we don't want to create further obstacles in the process.

I'd like you to comment on the flexibility of the Operations Office Manager that are called for in the bill; and your opinion whether or not he does have sufficient leeway to make the decision and policy guidelines that he should.

Dr. ZUCKER. I think your bill speaks to that very well. I think a good deal of the problem would be eliminating this—the Operations Manager would not have to go back to Headquarters.

The 60 days, I think that you have in your bill is plenty.

Mrs. LLOYD. Is it too long?

Dr. ZUCKER. Well, I'd like to see a little more pressure there. I don't know if 30 days is enough. Miss Fitzpatrick testified that——

Mrs. LLOYD. Okay, 60, 45, or 30?

Dr. BARON. We picked 30.

Dr. ZUCKER. Thirty.

Mrs. LLOYD. Thirty?

Dr. ZUCKER. I'll say less than 60. [Laughter]

I don't think they need 60.

Mrs. LLOYD. Well, we've got two out of three that are going to go for 30.

Dr. ZUCKER. Right, that's fine. That would not bother me.

Mrs. LLOYD. And I also want your views on the ability of the laboratories to award the individual contractors under the existing arrangements.

Dr. ZUCKER. Award the individual contract?

Mrs. LLOYD. Under existing arrangements.

Dr. ZUCKER. That sounds——

Mrs. LLOYD. Under existing contracts, your ability to award the individual inventors.

Dr. DRUCKER. Relative to Argonne?

Mrs. LLOYD. Under existing contracts.

Dr. DRUCKER. We have no difficulty doing that. This past year we have really had—we've had some grand presentations of checks. And as Miss Fitzpatrick pointed out, it seems to have served as a great spur to more invention reports.

Mrs. LLOYD. They're moving out.

Dr. DRUCKER. Yes.

Mrs. LLOYD. Sy?

Dr. BARON. We have a formula which starts with 50 percent of the first $100,000 goes to the inventor, and then percentages go down; and it's very attractive, and it's not too different from a lot of what the universities have. So I think we've had the inducement there and it should help.

Mrs. LLOYD. Very good.

Mr. Morrison?

Mr. MORRISON. All three of you represent very distinguished laboratories. Let me back away from the details of the bill, which I think probably most of us on the Subcommittee are cosponsors, so obviously we're enthusiastic about it, and appreciate your help in fine-tuning it.

I guess I'd like to be a little more philosophical and say, are we rushing in a direction that maybe we shouldn't be going? The National Laboratory's there for a specific purpose and we shouldn't be so concerned about applying this marvelous collection of scientific ideas that comes from such a facility.

Are we worrying about becoming job shops, very frankly?

Dr. **Drucker**. I think that that's a very important concern, and it's one that in part the bill addresses by putting a limit on how much that can be spent in industrial agreements.

You know, you really have to be a little bit of everything nowadays to survive. We really want to maintain at Argonne a base program that's been a very, very strong program for many years. We feel that a good technology transfer program with capability of working with industry, of taking basic ideas, and eventually making new products and processes, puts another arrow in our quiver.

No, we would not like to become a job shop or some labs—especially overseas—where something like that's just really happened, that really just works for industry on short-term problems. We don't think that that would be good for the laboratory, we don't think that would be good for the Nation.

Dr. **Zucker**. I think clearly there is a limit to which we can go and dealing with industry. My comment would be is that we are very far from that limit. We need to keep an eye out. We need to watch the situation. But there are very salutary effects that come from this. Much of our work that deals with industrial cooperation reflects back into our basic research programs in a very happy way. That is, problems become, say in the high temperature ceramics that we work with industry and toughen ceramics. We then try to find out what it is that really makes those ceramics so tough, and very often that results in excellent science; it advances the whole science of ceramics.

That's true in, for example, in certainly metallurgy again, where we have developed certain alloys and worked with Cummings—high-temperature alloys for diesel engines. And we now have a theoretical understanding of alloys, which is much better than it was before—in a sense was stimulated by this connection.

So it's not as if you have a sort of a finite loaf and you're slicing pieces off it. It isn't that simple a connection. Very often working with industry and things that seem to be quite applied, will result in a rather profound advance in basic understanding.

Dr. **Baron**. There is a problem from a management viewpoint. Working with the DOE it's—been, you know, a long-term relationship—it's warm and secure, and they've been supporting a lot of excellent work. And the idea of industry coming in and coming up to the 20 percent one year and then dropping the project cold the next year gives the management a nervousness. I mean, do you hire people and then drop them? Do you take them away from other commitments?

So, industry, by its style is not a long-term relation—may not be a long-term relationship. So we worry about that aspect of it. Certainly on the other side we want to work with industry and we work very hard to bring them into the fold. But you have to worry about it becoming a very major part of the operations.

Mr. **Morrison**. Who should control the thermostat, if you will, on this activity?

Dr. **Baron**. It has to be done by the lab director. He has the sensitivity of the payoffs and what's happening in all fields, and so he can trade off whether something like that works.

In the Department of Defense programs we wrestle with the same thing, because they have similar types of short-term needs, and you have to——

Mr. **Morrison**. We have a tendency here to want to say this is a good thing and so more is better, and then we end up mandating. You probably heard Congressman Watkins indicate, you know, a greater percentage of dedication of funds to technology transfer. And to a certain extent maybe that's desirable. But what I sense you're saying it's an important point, is that we really should keep this local and flexible so that each one of you, within your own jurisdictions, can make the decisions.

Dr. **Baron**. Can make the trade off, yes.

Mr. **Morrison**. I thank the gentleman, it's important.

Thank you, Madam Chairman.

Mrs. **Lloyd**. Thank you very much. Thank you, gentlemen, for being with us today. We appreciate your testimony. We're delighted with your enthusiasm.

Oh, pardon me, Mr. Fawell?

Mr. **Fawell**. That's quite all right, Madam Chairman.

Mrs. **Lloyd**. My sincere apologies.

Mr. **Fawell**. No, no, no.

Dr. Drucker, could you give me an example of what you referred to when you referred to basic or generic contracts. I guess you backed off that word "generic" and used "model." And also an example of the specific intellectual property right type of protection to which you referred to. An example of each of those. I'm not quite sure I——

Dr. **Drucker**. Well, let me do that backwards, starting with your second question.

We have a patent which we have let on a specific instrument to a small company. That patent will only be used by that small company to make that particular machine. This is a group of detectors. They will not be used by any other company. If we were to have given that company a non-specific license—a non-exclusive license—they wouldn't have taken it—there wouldn't be a new technology aborning, okay?

You said you can take this and you have total exclusive right to use it in this family of detectors. So that is an example of where you gave a specific patent and you said, "You've got all rights to it for this set of applications and no one else can use it."

Mr. **Fawell**. Someone might specific—I mean, exclusive or nonexclusive rights.

Dr. **Drucker**. Right.

And I think—you didn't ask this, but I'm going to answer it anyway.

On the other side of the question are things like the materials composition issues in superconductors. They use materials now at this point really aren't yet available for commercial use. They really don't have the set of properties you want.

You want to get those materials as they presently are out into the broadest sector of the technical and commercial public. And the way to do that is to license it cheaply, and let people use them in the development of new materials.

Now to your first question. We are presently working at Argonne with the help from our colleagues at Oak Ridge and Los Alamos in the superconductivity area on a model agreement, okay, for the Pilot Centers, which I think will answer your question. It will be one where essentially point by point we say, "Here's our practices, here's the range of things we can do or not do, and we can then negotiate with a company in a reasonable fashion on each point."

Mr. **Fawell**. You are basically non-exclusive any rights that you're——

Dr. **Drucker**. In a deal with a—what we would call a basic——

Mr. **Fawell**. I can understand that with superconductivity nobody——

Dr. **Drucker**. In many cases, right now, they would not be—they would be non-exclusive, exactly. Because we're not talking about specific device.

Mr. **Fawell**. Yes.

It has always seemed to me, being an attorney myself, and that one of your most difficult problems as has been indicated by all three of you, is to try to have some kind of a model agreement, and that will be acceptable to the attorney representing industry. And that has to be a tough job.

I can see Dr. Baron, you had indicated more pessimism than the others, but I can understand your pessimism. A great deal of education is necessary, I can well understand, not only with the lab personnel, but certainly with the various patent attorneys who represent the various industries. And I imagine a lot of industries try to get by without any patent attorneys; maybe just the general attorney handling this for the corporation.

Have you had any law forums, for instance, things of this sort, where you can call in—have some educational process that whereby both sides, I think, can learn something in regard to making that terribly difficult process, that at least I see a bit easier for both parties, so that eminent patent people could come in, and you could have some topnotch people throughout the country trying to work on—as close as you can get to that model agreement, because, however, as you have indicated, every agreement is a new agreement and boy, I can see that's true.

Dr. **Baron**. As you know, Congressman, we have two lawyers here and three opinions, so——

Mr. **Fawell**. That few, you're all right.

Dr. **Baron**. We have not been successful in—we've had a model or a generic—we've had an agreement—and every one of them gets reworked by the——

Mr. **Fawell**. Who creates your model agreement? I mean, at the laboratory, for instance?

It seems to me that you've got to call in—maybe go to the ABA and other organizations, to bring you the expertise that the attorneys will trust from one side—not knowing it was a product of the American Bar Association Task Force and groups that put it together—and you might have better luck.

Dr. BARON. I think the problem we have is that every company has its own culture, and it's hard to model an agreement that is generic for, you know, if you have a chemical company, utility, R&D company—each has its own history that it factors into its what you consider as the model. And trying to be generic with this kind of diversity gets very——

Mr. FAWELL. I could see Dr. Zucker's point—he said in effect, it's the liability aspects and the indemnification agreements that could drive anybody nuts. Because as you look at one of those agreements, the potential—they're drawn so all encompassing, is fantastic.

Dr. DRUCKER. Very well, I think that's a good idea—the idea of getting some industry lawyers and some DOE lawyers—attorneys together. And Alex just reminded me-we even have a vehicle for doing that. He and I are part of a task force involving the ASME—American Society for Mechanical Engineers. And this is the sort of thing that they're looking for—essentially——

Dr. BARON. All three of us are.

Dr. DRUCKER. Yeah, we all are. I forgot about you, Sy, sorry about that. So's Los Alamos involved in this—that this would be a good subject for a symposium; a session of a symposium at one of their meetings.

Mr. FAWELL. And I think you would agree that you can bring in the American Bar Association and patent one of those groups. If an attorney can see those—that premature—that sign-off—they'll feel more comfortable, that, hey, I'm being protected also.

Dr. ZUCKER. We may invite you to kick the thing off.

Mr. FAWELL. Well, whatever.

Thank you very much. I appreciate your testimony, it has been very interesting.

Mrs. LLOYD. Thank you, Mr. Fawell. And again, my apology—that was not intentional, I assure you.

Mr. FAWELL. Oh, I understand that.

Mrs. LLOYD. You're such a good Member, and I wouldn't slight you for anything in this world.

Thank you, gentlemen, for your testimony.

Dr. ZUCKER. Five milligrams is a thousandth of an ounce.

Mrs. LLOYD. Thank you.

PANEL 2

Mrs. LLOYD. Our second panel of witnesses consists of Dr. William Wiley, Director of Pacific Northwest Laboratory; Dr. John Whetten, Associate Director of Los Alamos National Laboratory; and Dr. Hubbard, who's Director of the Solar Energy Research Institute, who was with us recently.

We're just so pleased to have you with us today. Your entire statements will be made a part of the record, and you may summarize and proceed as you wish.

And, Dr. Hubbard, we understand that you are on vacation, and we just think that's beyond the call of duty to be here, but we're delighted to have you back with us.

Dr. HUBBARD. Well, I thank you, Madam Chairman.

Mrs. LLOYD. And because of that we're going to let you go first today.

STATEMENT OF DR. HAROLD M. HUBBARD, DIRECTOR, SOLAR ENERGY RESEARCH INSTITUTE, GOLDEN, CO

Dr. HUBBARD. Well, thank you, Madam Chairman, and it's not maybe the best way to spend my vacation. On the other hand, it may be, because it's a very important topic.

I would like to point out to the Committee that in Dr. Zucker's killer bee he pointed out that the instrumentation package is powered by a solar cell, and I think you should note that.

Mrs. LLOYD. I didn't think you'd let us not notice that—let it go without notice.

Dr. HUBBARD. I submitted a statement for the record, but I would like to talk a little bit, if I may; and sort of like Congressman Watkins, I'd rather like to talk from my heart—and I'd like to broaden the subject a bit.

We've talked a great deal about technology transfer. And as somebody who has worked in industry and worked in contract research organizations, and now in a——

Mrs. LLOYD. Would you excuse me, may I interrupt you just one minute?

I'm going to have to excuse myself because I have to appear before the Rules Committee on Price-Anderson, which I think is also—you have a passing interest in this morning. And if, without objection, Mr. Morrison will sit in the Chair while we receive your testimony.

Mr. MORRISON [presiding]. Thank you. Hurry back——

Mrs. LLOYD. Thank you.

Mr. MORRISON [continuing]. With the right results.

Please proceed, Doctor.

Dr. HUBBARD. Thank you, Mr. Morrison.

I think what we're talking about is utilizing the resources of the National Laboratories—to foster technological innovation in the U.S. economy. And I think we're talking about forging the cooperative venture, so to speak, with industry to do that. And that's a rather significant change, I think, in the culture and mission of the Department, if we really mean that.

The Energy Research Advisory Board, in reviewing what the energy R&D—I mean, what the R&D mission should be within the Department—pointed out that there are generally thought to be three aspects of the Department's mission. And one has to do with energy-related research, energy security; one has to do with maintaining defense programs; and one has to do with working at the universities to maintain the scientific base. What is missing, I think, is a statement which says that it also has a commission to work with industry to maintain the economic and industrial technological base.

And I believe that sort of a mandate, as was pointed out by Senator Domenici, and has been pointed out to in testimony by Sig Hecker of Los Alamos Laboratory is politically important.

And the bill that we're considering today, and you ask me to comment on today, goes in that general direction.

We've had a lot of experience at the Solar Energy Research Institute in working with the private sector, and specifically in cooperative research and development ventures, we've had a fair amount of successes in that. We've had some bumps and failures, and most of those had to do with the mismatch of culture and a mismatch of procedures. As one of my colleagues on the previous panel pointed out, every company has its own culture.

Now, the Department of Energy has its own culture, and the culture has grown up dominated by the traditional mission. And I think we're talking about changing that mission, and that means the culture has to change—and that's a long process.

In our experience with doing business with industry, they do have, of necessity, a short-term perspective. In talking to people who are investing venture funds, they've got a three-year horizon at most. That means, I believe, that very often science and technology has to be carried further in the Government laboratories than has been traditionally done, at least in things that relate to commercial ventures, and in order to reduce the risk to industry sufficiently and to get it within their time horizon. And that has something to do, then, with a redefinition perhaps of the role of the Government laboratories, and that's a very vexing kind of a question and a very delicate kind of a question.

There is a need today for a very rapid adaptation of technology. So the response time needs to be rapid and it needs to be relatively short.

I do not believe one can wait until the technological application is thoroughly conceptualized and until a piece of carefully defined intellectual property is in existence and then go market to the industry and be very successful. I think industry has to be involved in the R&D process initially, and they have to have a role in defining the goals of that process and procedure.

Now, SERI is the only laboratory that is assigned to the Assistant Secretary for Conservation and Renewable Energy. We have been very fortunate, I think, in that Assistant Secretary Fitzpatrick has been in that position for five years, and she has been very, very supportive of the whole process.

As she pointed out earlier, the programs of that office are primarily directed at the private sector. So she's been very, very helpful—and has had a lot of successes. But the average time in residence by an Assistant Secretary in the Department has been 16 to 18 months, and I think that means and makes it somewhat imperative, therefore, that there be established in the Department and mandated into the mission of the Department so that it's rather securely defined, the role of the National Laboratories as national resources to be used to foster technological innovation. And technology transfer is a very, very major part of that.

In general, the goals of the legislation are consistent with our experience and are reinforcing of our mission. I've got a couple of specific comments.

There is the provision for up to 20 percent in collaborative R&D, and I understand why that's there. It's there out of a concern that the primary mission of the laboratories be maintained.

In our own particular case, it's possible that 20 percent prohibition could be a problem to us. So we would like to see language in the legislation that permits, under the proper circumstances, that to be changed by agreement with the Department .

I think Secretary Fitzpatrick mentioned the problem of defining what is a domestic entity. It's a matter that we have a lot of concern about now and it's not—well, domestic entity means different things to different people, so some clarification of that would be proper, I think.

I guess I'd like to make a comment about superconductivity. SERI is not one of the three centers for superconductivity research. Nevertheless, because of our background in semiconductors and because of our background in photovoltaic cells—which are a special application of semiconductors—and because we have great experience in thin film deposition—and that's a major approach to superconductivity, those provisions of the bill are of particular interest to us.

We've been interested in observing the process my colleagues are going through in evolving a model contract that could be used in that particular area, and we would applaud that. I have some of the same misgivings about generic contracts and model contracts that my colleagues do. Nevertheless, I think it's important to go through that exercise in order to define the boundary conditions, at least, of what is concern to the laboratories, what is concern of DOE.

One of my colleagues—who shall be nameless—once said that in dealing with DOE lawyers, if it is not specifically allowed in legislation, then it is, by interest, prohibited. And so it is necessary, therefore, I think, to get the boundary conditions roughed out. But I do believe that as we negotiate contracts with industry, we will find that almost all of them require some kind of special modification.

In general, then, let me say that we are in sympathy and we applaud the bill. I understand some of DOE's misgivings—I hope they can be worked through.

Appreciate the diligence and interest of the Committee in what I believe is a very, very important problem, and a very important challenge before the laboratories, before the Department, and before this country.

Thank you.

Mr. MORRISON. Thank you, Dr. Hubbard, for being here, and your usual excellent job of presenting your views to the Subcommittee.

[The prepared statement of Dr. Hubbard follows:]

TESTIMONY OF DR. H.M. HUBBARD
DIRECTOR
SOLAR ENERGY RESEARCH INSTITUTE

BEFORE THE
U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT

WASHINGTON DC
JULY 27, 1988

Introduction

In January 1987, President Reagan challenged the United States to use the federal storehouse of scientific and technological ability to regain its competitive edge and remain economically strong. He said "...it is important not only to ensure that we maintain American preeminence in generating new knowledge and know-how in advanced technologies, but also that we encourage the swiftest possible transfer of federally developed science and technology to the private sector." Congress, having already recognized the importance of utilizing technology developed at the federal laboratories, had passed Public Laws 98-480, 98-620, and 99-502 to help facilitate the transfer of technology. Among other things, these laws made it easier for the private sector to obtain title to, or licenses on, properties developed under federally funded R&D contracts, encouraged cooperative R&D agreements between federal laboratories and the private sector, provided incentives to the private sector and the federal laboratories, and established the Federal Laboratory Consortium.

With bills like the proposal before us and Senate Bill S. 1480, Congress seeks to further engender our competitive stature by formulating policy that would encourage cooperative R&D agreements between the Department of Energy National Laboratories and the private sector and that would streamline the procedures whereby these agreements would be entered into.

This Administrative and Congressional activity highlights what has become a consensus in the United States: the world is becoming a more competitive place. Not only that, our nation is losing its once dominant position, as evidenced daily by our eroding share of the world markets and our continuing trade imbalance.

But the consensus goes beyond this. Our competitive position was built around our technological edge and the new, innovative ideas that evolve from that technological base. Regaining our competitive edge will also depend heavily upon our scientific and technological capabilities, but not just on discovering or creating innovative technology. As a nation, we still do plenty of that — our federal laboratories, industries, and other public research facilities have a great store of scientific and technical knowledge. Rather, our competitive stature also depends upon how we manage that technology, how we get it from the laboratory to the marketplace. It is only recently that we have begun to realize that our federal laboratories, industries, and other public research facilities must do more than create and retain technological bases. These laboratories and research facilities should also play a major and more distinct role in contributing to this nation's industrial base by transferring their appropriate technology to industry in as quickly and smoothly a manner as possible.

To achieve this, to quote the Office of Technology Assessment's recent study Technology and the American Economic Transition, Choices for the Future, "It is essential that the United States improve on the way it combines corporate and public resources in the pursuit of innovation." That is, we must combine the scientific and technological capabilities of the federal laboratories with the innovative industrial and marketing expertise of U.S. industry. We have here, however, the potential for a mismatch of interest. Industry is concerned primarily with profit margins. And, the more our competitive stature seems to be eroded, the more important the near-term profit margins appear. Among other things, this means that industry must act fast when trying to get an edge on a market. Federal laboratories and other public research facilities, on the other hand, are concerned with long-term public issues. This often entails well thought out, calculated, thorough research and public policy, which can consume large spans of time.

Competitiveness, however, is an issue that transcends these seemingly disparate concerns, for competitiveness is both a short-term and a long-term issue. We must cogently build our capability to remain competitive well into the foreseeable future. But to do this, it is essential that we retain our economic strength, i.e., that we remain competitive at each step along the way. Thus, to remain competitive, we must not only build a large and sophisticated technology base for the future, but we must transfer as much of that base as possible to American industry in a smooth and quick manner.

It is important to do this, and this proposed legislation is a positive step in that direction. But in forming the all-important procedures that facilitate this effort there are some tricky and sensitive issues that the Congress and the Department of Energy must come to grips with. For, while aiming for the ultimate goal of keeping America competitive through the facile integration of technology into our social and industrial infrastructures, the procedures that Congress and the Department fashion must maintain many complex balances. The procedures must, for example —

> allow public disclosure of discoveries affecting the common interest, while permitting private firms to maintain rights to specific proprietary ideas;
>
> show fairness to competing industrial interests, i.e. allow administration of public monies, even when mixed with private funds, in such a way that will not show undue favoritism or give undue advantage to particular contractors;
>
> take into account the Department of Energy's statutory obligations to carry out public energy policy, allowing for resolution of any conflict that may arise between this and the need to enhance competitiveness;
>
> determine how best to allow public disclosure while retaining the edge for domestic firms; and
>
> be simple and expedient to use, and thus "user friendly" for businesses and industry.

Importance of Technological Competitiveness Procedures to SERI

Whatever form the procedures take, they will be vitally important to the Solar Energy Research Institute. This is because SERI was founded for the purpose of performing basic and applied research on renewable energy and bringing the results of that research into society; everything we do is with the ultimate intention of transferring the technology into the private sector. As a consequence, transferring our technology has long been an inherent part of our mission and the ultimate utilization of our discoveries has always had primacy in our planning lexicon.

Since its inception SERI has developed a strong working relationship with industry through several valuable mechanisms. These include the numerous successful cooperative R&D programs which we have presented testimony to you on previously, and through our continuing use of a Private Sector Partnership Board. The PSPB, as we call it, is made up of key executives from energy and non-energy industries and provides SERI and MRI counsel on how to strengthen and expand our interactions with the private sector.

Moreover, one of the most facile ways we have for efficiently and effectively transferring our technology is through cooperative research and development agreements with industry. But because of often cumbersome mechanisms for doing this, we have experienced difficulty, delays, and industry reticence. So procedures that allow us to more easily enter into agreements on cooperative R&D and common ventures, so we can more efficiently transfer our technology, are procedures that would help us to better fulfill our mission. Plus, since inexpensive, accessible, and plentiful energy is vital to this nation, procedures that enhance the establishment of innovative domestic energy technologies are very important to the long-range economic well being of our country.

That's why we agree with the general goals of the Congress and the Administration to ease the transition of this nation's technology into the marketplace. But for our own (SERI's) purposes and for the general welfare of the nation, we feel that any mechanism the Congress and the Administration fashion must take into account several things.

First, it must recognize that the often relative slowness with which technology leaves the nation's laboratories and enters the marketplace is largely culturally bound. Historically, industry has not looked to the national laboratories as a source of valuable technology transfer, because transferring our technology has often been a secondary or tertiary issue. Unfortunately, in some cases both the nation's laboratories and the nation's businesses have grown accustomed to this attitude. To help change this attitude, we should try to instill an ethic of technology transfer at the nation's laboratories; transferring our technology must be seen as an integral and essential part of the mission of the laboratories.

Any mechanism must also foster and encourage the use of the national laboratories for the enhancement of the US industrial base, and not just the building of a large, and often remote technological base. This entails at least that industry must not only become more aware of the projects and capabilities of the national laboratories but that the national laboratories must become more aware of industry, their needs, capabilities, and projects.

It must clarify what technology can be transferred and how the technology can be transferred: what is allowed, what is not allowed, what is negotiable, what parties may partake in the transfer, and what information may or may not be transferred.

It must maximize the timeliness of transfers, taking fully into account the way in which industry operates, e.g., what risks industry is able to undertake and what risks it is not able to undertake, and minimize the obstacles of agreement for cooperation between laboratories and industry. One way of doing this, and the procedure that SERI promulgates for its own cooperative work with industry, is to get agreements worked out as early as possible in the planning process of a research project. This allows an early determination of the project's consistency with DOE priorities. It also allows cooperation to take place from inception to utilization, and technology to be smoothly transferred all along the path. A mechanism that promotes such early and continuous involvement in the process of researching, developing, and transferring technology will go a long way toward helping our nation remain competitive.

One instructive example of how SERI is exploiting the advantages of early and continual collaboration is in our work producing adhesives from sawdust or bark. SERI scientists, and a team of experts from academia and industry are investigating ways to use a SERI-invented vortex reactor to pyrolyze waste sawdust or bark into phenolic resins. These resins, which currently are derived from petroleum, are used by the forest products industry as adhesives for wood paneling, plywood, molding, other board products, and insulation. In 1987 the U.S. produced about 2.6 billion pounds of these resins at an average cost of 50" per pound.

After only 18 months of investigation, the research team has developed formulations of pyrolysis oils that could replace 50% of the phenol in molding compounds and plywood adhesives. Moreover, they project that the cost of the phenol derived from sawdust or bark could be as little as 10" to 16" a pound, or even less. Replacing 50% of the petroleum derived phenols could save our nation almost a tenth of a quad of energy per year by 2010 and, in plywood and molding products alone, could initially save the forest industry $30 million dollars annually in feedstock costs. All of this with a relatively small R&D investment from the government.

Since the beginning of this program, a host of interested companies have been directly involved either through research or through an industrial review board. Interested private sector parties include the American Plywood Association, Boise Cascade, Borden Adhesives, Gaylord Chemicals, Georgia Pacific, Koppers Co., Perkins Industries, E. Seidel and Associates, and Weyerhaeuser Co. This has resulted in several of these companies joining with SERI in a cooperative R&D consortium.

Specific Concerns

We agree with the general goals of the proposal before us today. However, there are certain issues that present some concern. I have chosen to comment on three or four of those that seem particularly relevant to laboratories such as SERI. I feel that any other issues that may remain would be more appropriately addressed by the Department of Energy.

Title I, Section 103, Subsection (p), Provision (1): "Each National Laboratory may ... "accept, retain, and use funds, personnel, services, and property from collaborating parties, and provide personnel, services, and property to collaborating parties."

> This language is certainly desirable from a laboratory director's perspective. However, it might be interpreted as authorizing a national laboratory to undertake independent industrial R&D that might be in conflict with DOE's mission, program priorities, and public interest responsibilities.

Title I, Section 103, Subsection (r): "The cumulative total of the Department of Energy funding of all cooperative research and development agreements entered into by each National Laboratory under this section may not exceed 20 percent of the National Laboratory's annual budget."

> We understand the intent of limiting DOE funding for cooperative R&D funding to 20% of a national laboratory's total annual funding; it is so industrial R&D does not distract a national lab from the primary DOE mission. This limitation, however, does concern SERI for a several of reasons:
>
> > As we have mentioned before, SERI is unique in that virtually all of our research is ultimately aimed at finding some end use in society. So, surpassing the 20% limitation would not distract SERI from its primary mission. On the contrary, an arbitrary limit of 20% could hamper our mission, and could have the unintended effect of cutting our cooperative funding, which is contrary to the spirit of the proposal.

To avoid such a possibility, we recommend that the clause "... unless otherwise approved by the Department of Energy" be added at the end of the provision

Title I, Section 103, Subsection (w), Provision (6): "Definition. For the purposes of this subsection, 'third parties' and 'third party applicants' are domestic entities located in the United States whose research development and other activities occur substantially in the United States. Domestic entities include industrial organizations, corporations, partnerships, limited partnerships, industrial development organizations, public and private foundations, and nonprofit organizations such as universities and consortia."

We have two concerns with this provision:

We feel that the term "domestic entity" is a difficult term to deal with and needs further, careful clarification. For example, is a domestic entity one that is a totally owned American firm, primarily American owned, American owned with foreign subsidiaries, foreign owned with American subsidiaries, etc.?

A similar problem arises in the interpretation of the phrase "...research, development, and other activities occur substantially in the United States."

National Superconductivity Program

I would like to close with a few thoughts on the value of superconductivity research to renewable energy and its pertinence to research at the Solar Energy Research Institute.

As we are all aware, the realization of high temperature superconductivity materials could drastically change many aspects of our lives, including the way we use and store energy, the amount of energy we use, the way we travel, and more. It is no different with renewable energy. This is because superconductivity will be extremely applicable to energy storage — superconductive magnetic storage devices could be 99% or more efficient. This would help us address one of the major issues facing renewable energy, its intermittent nature. With superconductive magnetic storage devices, solar energy systems would become immediately competitive for utility and other large-scale applications.

This is just one of the reasons the Solar Energy Research Institute is building up its program in superconductivity research. There are other reasons. For one, SERI has the capabilities. Through our work in photovoltaic materials, we have some of the most sophisticated and advanced facilities for thin-film research in the country. Thin film research appears to be essential for the ultimate success of superconductivity. This is because the best superconducting properties occur in thin films. For example, current density (the amount of current passing through a cross-sectional area) is critical. And, thin films can carry up to a 1000 times more current through a cross-sectional area than can bulk materials, such as is used in wires.

Also, we have the affiliations. We are, for example, in close proximity to, and often engage in cooperative research with, the Boulder NBS laboratories, one of the designated laboratories for the National Superconductivity Program. In fact, we are currently working with the Boulder NBS, Ball Aerospace, Coors Ceramics, and the Colorado School of Mines in planning superconductivity research in the state of Colorado. We are also pursuing joint research proposals with TRW, which has expertise in superconducting electronics, and with General Dynamics, whose expertise lies in large-scale superconducting applications, such as the development of magnets. Additionally, we also work closely with utilities, maybe the prime customers for superconductive transmission and storage.

Finally, we are an integral member of the research community. This is one reason we are currently co-sponsoring and organizing an international conference on superconductor research and applications. Attendees from the conference will come from Japan, Europe, SERI, DOE, and National Laboratories such as Lawrence Berkeley Laboratory, the Naval Research Laboratory, and the National Bureau of Standards.

Through our complementary work in superconductivity and solar energy, and through the our deeply entrenched our mission to transfer technology to the private sector and hence to utilitarian end uses, we feel that we could be in a position to not only help the United States with its energy security but also with its attempt to stay ahead in the never-ending race to remain competitive. Mechanisms that can help us, and other national laboratories, do one will help us do the other and will help the United States remain a great nation.

Closing

Under the current circumstances in which this country is being challenged in the very area that has historically been its greatest strength, namely, its scientific prowess, it is more important than ever that we utilize effectively the resources of the national laboratories. Frankly, the Department and its laboratories, for reasons that are understandable, have not been fully effective in the past in their efforts to put their intellectual muscle and unique capabilities to work with industry to strengthen our industrial base. We are certainly improving, and I know that the trend will continue. The attention being paid to this important area by Congress is greatly appreciated, and I thank you for the opportunity for presenting our views.

Mr. MORRISON. I'd now like to call on Dr. Bill Wiley from Pacific Northwest Laboratories, my constituent. Bill, it's super to have you here and we're proud of what you're doing.

STATEMENT OF DR. WILLIAM R. WILEY, DIRECTOR, PACIFIC NORTHWEST LABORATORY, RICHLAND, WA

Dr. WILEY. Thank you, Mr. Chairman.

I have prepared some written remarks which I will leave for the Committee, and I have some oral remarks that I would like to address, if I may.

The outcome of my oral remarks are these: that I would like to express my appreciation for the recognition of the Committee—Subcommittee—that—that this is a competitiveness issue, and is important.

I would also like to give in my oral remarks the need for flexibility balance by a statement of authority which gives the National Laboratories and the other Federal laboratories of this country an opportunity to proceed with technology transfer.

I think we will all agree that every effort must be made to remove the barriers to laboratory/industry relationships. We must also create incentives whereby those of us in the National Laboratories can effectively and efficiently transfer the results of research, intellectual property, and other property into the hands of the entrepreneur, or into corporations, who will generate new products and new processes and thereby contribute to America's competitiveness in this the global economy.

Technology transfer and competitiveness—let's talk about that for a second. Over the past few years, competitiveness has become an important issue for this country. Competitiveness is the focus of numerous articles; it will continue to be the focus of numerous articles, reports, organizations, Presidential hearings, Congressional hearings. There are several individual components of the competitiveness issue, such as the quality of our educational system; the number of American students who are entering and remaining in science and engineering; productivity factors; balance of trade factors, et cetera.

Transferring research and technology from the laboratory to commercial products and processes is also a very important part of this competitiveness issue.

For many years, Congress has recognized that the scientific resources within the Federal Government's laboratories were virtually unknown to industry. Even worse, it became evident that there were administrative, legal, and institutional impediments for the laboratories working cooperatively with the private sector.

Something had to be done to make this worthwhile—worthwhile for the scientists in the Federal laboratories to not only talk to their counterparts in the private sector, but to make it easier for the two entities to work together to solve common national problems.

Something also had to be done to make it worthwhile for industry to invest in potential products from laboratory research. The Stevenson-Wydler Act was important to this effort.

Since then, additional actions have been taken by Congress and the President in the form of legislation and Executive Orders. As a result of these changes, the laboratories have initiated several innovative arrangements in the context of accelerating technology transfer. Clearly then, progress has been made. I believe much more needs to be done. You are working on that today.

As a result of the progress that has been made, however, the Pacific Northwest Laboratory, like the Department of Energy's other National Laboratories, has significantly expanded its technology transfer efforts in order to respond to the opportunities created by these new legislative and executive mandates that I mentioned.

It is worth noting, however, that PNL is already unique among the DOE laboratories as it relates to working with industry on cooperative research projects.

In addition to our contract with the Federal Government to operate PNL, Battelle has a separate contract with the Department of Energy, which permits us to do proprietary research and development for the private sector at our laboratories in Richland. This situation stems from the original contract proposal to operate PNL and the fact, that Battelle Memorial Institute's principal business is contract research.

Thus, the scientists working in the laboratory may be conducting research for both Government and industrial clients during the course of a given year.

Over the past five years, this business with industry has resulted in an average of 350 contracts with $25 million annually. Therefore, in a real sense, PNL has not had the same contractual impediments as the other DOE laboratories in working with industry.

On the other hand, we are subject to the same regulations as the other Federal laboratories relating to federally-sponsored research.

Lest we forget, however, that PNL has something that none of the other laboratories have, I hasten to point out the conditions of that agreement. Battelle has invested $50 million in facilities and equipment in Richland, adjacent to the Government's facilities, and we conduct our research and development programs in a consolidated laboratory comprised of Government-owned facilities and Battelle-owned facilities.

I should also point out that Battelle pays upfront to the Government for the use of the Government-owned equipment and facilities to do research work for the private industry.

Mr. Chairman, in addition to being laboratory director, I've also served on the Energy Research Advisory Board's Panel on Research and Technology Utilization. Our Panel received briefings from individuals from the industrial, university, and the Government sector.

In our report, which was approved by the ERAB Task Force at its recent meeting, we made several recommendations which are consistent with what I perceive your objectives with this legislation to be. These include DOE policy towards technology transfer should be strengthened. Another area is for the appropriate research projects funding must be allocated to extend efforts to accomplish technology transfer.

In addition, intellectual property procedures must be continuously improved and greater delegation of authority provided to laboratory management.

Finally, the report states that incentives and rewards should be created for successful transfer.

I must add that John Whetten was on the Task Force as well as myself.

It suffices, therefore, to say that your objectives and ERAB's recommendations are very, very complementary.

Let me summarize, then, by saying that I believe there are three important objectives we should seek in making technology transfer successful in any legislation that we promote: uniformity and consistency among all agencies and Federal laboratories in their policies with regard to encouraging cooperative research and development arrangements with the private sector.

Secondly, flexibility within this uniformity to be able to cooperate with the entrepreneur or small business person who does not have the financial or human resources to negotiate terms and conditions for months on end; and the large companies who really do have that capability.

Third, I think we should have the incentives for all parties to work together toward the goal of commercializing technology as rapidly as possible. The current set of regulations and laws do not meet all of these tests.

I urge the various Committees of Congress—this one in particular—to work together so that the end result applies uniformly to all laboratories. One of the reasons the laboratories have not been "user friendly"—to quote Mr. Domenici—to industry is because we have different software packages in these various laboratories. These are reflected in contracting mechanisms.

I urge this Committee to consider the criteria as you proceed toward our common objectives of creating flexibility and consistency and uniformity throughout the interactions of all of the National Laboratories.

Thank you, Mr. Chairman.

Mr. MORRISON. Thank you, Dr. Wiley.

[The prepared statement of Dr. Wiley follows:]

Statement of

Dr. William R. Wiley

Director

Pacific Northwest Laboratory

Before the

Committee on Science, Space, and Technology

Energy Research and Development Subcommittee

United States House of Representatives

Washington, D.C.

July 27, 1988

Introduction

Madam Chairman and Members of the Subcommittee.

I am pleased to be here today to discuss efforts to enhance the transfer of technology from the federal laboratories to the market place. I think we all agree that every effort must be made to remove the barriers to laboratory-industry partnerships. We must also create incentives whereby those of us in the national laboratories can effectively and efficiently transfer the results of research--intellectual property--into the hands of the entrepreneur or the corporation who will generate new products and new processes, and thereby contribute to America's competitiveness in the global economy.

Technology Transfer and Competitiveness

Over the past few years, "competitiveness" has become an important issue for this country. "Competitiveness" is the focus of numerous articles, reports, organizations, and hearings. There are several individual components of the "competitiveness" issue, such as the quality of our educational system, the number of American students entering and remaining in science and engineering curricula, productivity factors, balance of trade, etc. Transferring research and technology from the laboratory to commercial products and processes is also a very important part of "competitiveness."

For many years, Congress has recognized that the scientific resources within the federal government's laboratories were virtually unknown to industry. Even worse, it became evident that there were administrative, legal, and institutional impediments to the laboratories working cooperatively with the private sector. Something had to be done to make it worthwhile for the scientists in the federal laboratories to not only talk to their counterparts in the private sector but make it easier for the two entities to work together to solve some of our national problems. Something also had to be done to make it worthwhile for industry to invest in "potential" products from laboratory research. The Stevenson-Wydler Act was a very important first step in 1980. Since then, additional actions have been taken by Congress and the President in the form of legislation and Executive Orders. As a result of these changes, the laboratories have initiated several innovative arrangements in the context of accelerating technology transfer. Clearly, progress has been made; I believe much more can be done.

Laboratory-Industry Relations at PNL

The Pacific Northwest Laboratory (PNL), like the Department of Energy's other national laboratories, has significantly expanded its technology transfer efforts in order to respond to the opportunities created by these new legislative and executive mandates. It is worth noting, however, that PNL is already unique among DOE's laboratories as it relates to working with industry on cooperative research projects. In addition to our contract with the federal government to operate PNL, Battelle has a eparate contract with the Department of Energy, which permits us to do proprietary research and development for the private sector at our laboratories in Richland, Washington. This situation stems from the original contract proposal to operate PNL and the fact that Battelle Memorial Institute's principal business is contract research. Thus, the scientists working in the laboratory may be conducting research for both government and industrial clients during the course of a given year. Over the past five years, this business with industry has resulted in an average of 350 contracts worth $25 million annually. Therefore, in a real sense, PNL has not had the same contractual impediments as the other DOE laboratories in working with industry. On the other hand, we are subject to the same regulations as the other federal laboratories relating to federally-sponsored research.

Lest one assumes that PNL has "something" no one else has, I hasten to point out that Battelle has invested $50 million in facilities and equipment at Richland adjacent to the government's facilities and we conduct our research and development programs in a "consolidated laboratory" comprised of government-owned facilities and Battelle-owned facilities. I should also point out that Battelle pays the government for the use of government-owned equipment and facilities to do research for private industry.

The Energy Research Advisory Board's Views on Technology Transfer

Madam Chairman, in addition to being a laboratory Director, I have also served on the Energy Research Advisory Board's Panel on Research and Technology Utilization. Our panel received briefings by induviduals from the industrial and university sectors on technology transfer. In addition, we heard from representatives of other federal agencies on how each organization promotes technology transfer. In our report, which was approved by ERAB at its recent meeting, we made several recommendations which are consistent with your objectives. These include:

- DOE policy towards technology transfer should be strengthened.
- The Secretary of Energy should initiate a program with U.S. industrial leaders to better acquaint American industrial management with the DOE laboratories' research and technology results and capabilities.
- The Energy Research and Defense Programs should increse planning for technology transfer.
- For the appropriate research projects, funding must be allocated to extend efforts to accomplish technology transfer.

- Intellectual property procedures must be continuously improved and greater delegation of authority provided to laboratory management.

- To fulfill the expectations that the size and quality of the laboratories suggest, those laboratories that have the skills should create joint research programs with industry that are focused on particular industrial sectors.

- Incentives and rewards should be created for succesful transfer.

- The DOE and its laboratories should create a program to allow sabbaticals to industrial research and development laboratories.

Suffice to say that your objectives and ERAB's recommendations are complementary.

Summary

I believe there are three important objectives we should seek in making technology transfer successful:

1. Uniformity and consistency among all agencies and federal laboratories in their policies with regard to encouraging

cooperative research and development arrangements with the private sector.

2. Flexibility within this uniformity to be able to cooperate with the entrepreneur or small businessman who does not have the financial or human resources to "negotiate" terms and conditions for months, and the large company who does.

3. Incentives for all parties to work together toward the goal of commercializing technology as rapidly as possible.

The current set of laws and regulations do not meet these tests. I urge the various Committees in Congress to work together so that the end result applies uniformly to all laboratories. One of the reasons the laboratories have not been "user friendly" to industry is because we have different "software packages" or contracting mechanisms. I urge you to consider that criteria as you proceed toward our common objective.

Mr. MORRISON. We move on now to Dr. John Whetten at Los Alamos.

STATEMENT OF DR. JOHN T. WHETTEN, ASSOCIATE DIRECTOR, LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NM

Dr. WHETTEN. Thank you very much, Mr. Chairman.

While flying over the parched midsection of the country yesterday evening to get here to Washington for this hearing, I read an article in a national magazine about ideas about climate change. As a geologist, I recognized that climate change is—is inevitable and goes on all the time; only the rate changes. Sometimes it goes on speedily and we can detect climate change in periods of days, months, or years; other times it is almost imperceptible and in the lifetimes we may not recognize significant change.

The good news of what I want to report today is that in my capacity as the official at Los Alamos in charge of technology transfer, I've observed that the climate for technology transfer at the Department of Energy is in fact changing at a perceptible rate. We see a great deal of activity and even some motion in the direction of making the Department and its resources more accessible and available, including the laboratories, to the private sector to increase economic and technological competitiveness.

The bad news—as my director, Sig Hecker, stated in testimony to this subcommittee about a month ago—is that the progress is agonizingly slow. We complain about the rate. We think things could in fact go on very much faster. And if measured against the yardstick of Executive Order 12591, which requires, in fact, the swiftest possible transfer of federally developed science and technology to the private sector, we think we could do much more and we think we could do things in fact very much more rapidly.

Let me comment first on some progress that I think is being made. Assistant Secretary Fitzpatrick this morning testified that Secretary Herrington, in April, had created three Superconductivity Pilot Centers: one at Argonne National Laboratory, one at Los Alamos National Laboratory, one at Oak Ridge National Laboratory.

Since April, we've been working very, very hard with DOE—particularly in the field offices—to work to clean up the business interface with industry.

In proposing Superconductivity Pilot Centers, we consulted at great length with industry and found that from their viewpoint the key elements in implementing cooperative agreements such as these are what we call, with some literary license, the three S's: simplicity, speed, and certainty. These are absolutely critical.

To go into more relevant detail, industry would like to see a simple, clear, and liberal intellectual property policy; speedy resolution of titles and licenses to patents; an upfront assurance of conditions under which intellectual property rights will be allocated; and assurances that company proprietary information generated in industry/laboratory cooperation will be protected.

Industry executives, we found, expect to get what they pay for and, conversely, they do not expect to get what they do not pay for.

We have discussed this with DOE and we think that as far as the field offices are concerned, we have agreements with them to work in a way that—that will satisfy industry in the Superconductivity Pilot Centers in the areas that we've mentioned.

We look forward to a timely review and action by headquarters on the agreements that we have reached with the field offices so that we can in fact implement this rather novel tech transfer mechanism as a pilot—on a pilot basis, so that it can be extended more broadly throughout our laboratories .

Now regarding the proposed legislation. We believe that much progress can be made without new legislation as is being proposed with the new Superconductivity Pilot Centers. However, I would remind you, the Superconductivity Pilot Centers—important that they are to our laboratories—are only—are less than one percent of the total program at Los Alamos. And we have much, much more that we could bring to the table and offer to American industry.

In fact, we think that broader application of Executive Order 12591 would still be appropriate, because, you see, DOE contends that Los Alamos and other DOE laboratories that are government-owned and contractor-operated, for these facilities it does not have the authority to apply the dictates of this Executive Order, particularly with regard to delegating the authority, which is routinely—routinely to enter into cooperative R&D agreements, or in permitting the laboratories to retain rights and software and other technical data.

DOE has reiterated on a number of occasions that new legislation must be enacted to achieve this objective.

We perceive this bill and Senate bill 1480, which has been introduced by Senator Domenici, to be statutory mechanisms by which the principles embodied in the Executive Order can be applied broadly to all DOE laboratories.

We do have some rather strong concerns about certain specific aspects of this bill that we have set forth in a separate paper which, if you desire, we would be most pleased to make available to the Subcommittee staff for consideration.

Mr. MORRISON. We would—Doctor, we would ask for that, and we would make it a part of the record as soon as it's delivered.

Dr. WHETTEN. I want to conclude by saying that the DOE laboratories, we recognize have important missions for the country. We don't think that they can, or should, attempt to replace industry's own R&D capabilities. However, we can do much more than we have been doing to turn the research capabilities necessary for our primary missions into improving the country's technological competitiveness.

In preparing for this testimony, I read the hearing records of—of other hearings which this Subcommittee and the full Committee has held, and I'm well aware that there is a perception on the part of Congress, this Subcommittee, and upon many expert witnesses that have testified before you, that in many critical areas we are losing the race to competitiveness with Japan and other foreign countries.

This is not, in our opinion, due to the lack of basic research in this country, but it's due to the lack of the proper coalition of universities, laboratories, Government and industry, working together towards—towards a common goal.

The laboratories we are particularly strong in developing high risk generic technologies in the pre-competitive, pre-commercial phase. The national need to be competitive makes this an ideal opportunity to implement new ways of establishing industry and laboratory partnerships.

We see many opportunities emerging and hope soon to take maximum advantage of them.

That concludes my statement. I thank you very much for the opportunity to present it.

[The prepared statement of Dr. Whetten follows:]

U. S. House of Representatives
Committee on Science, Space, and Technology

Hearing On
the Proposed National Laboratory Competitiveness Act of 1988

Statement by
John T. Whetten, Associate Director
Los Alamos National Laboratory
July 27, 1988

I. INTRODUCTION

In this statement, I briefly review Los Alamos technology transfer experiences and activities, provide an update on work to establish a network of Superconductivity Pilot Centers, and present comments on the draft copy of the "National Laboratory Competitiveness Act of 1988."

A. Technology Transfer--Experiences/Successes

Technology transfer in a variety of forms has been occurring at the Department of Energy (DOE) laboratories almost since their inceptions, but it was not until 1980 that Congress enacted legislation that clearly declared technology transfer from the federal laboratories to be in the national interest. The record of the DOE laboratories in transferring technology to industry certainly includes noteworthy successes. For example, the weapons laboratories--Los Alamos National Laboratory, Lawrence Livermore National Laboratory and Sandia National Laboratories--have for decades been working with, and transferring technology to, industrial contractors within the DOE nuclear weapons community.

Los Alamos National Laboratory has, from its formation, been dedicated to the full range of research and development activities associated with the development and delivery of a product. This philosophy of frontier science, sound engineering, and development of quality products has been applied to many of the Laboratory's programs. We are now working on several Armor/Anti-Armor programs that transfer technology directly to private-sector contractors for the Department of Defense and are working with other contractors on the Ground Test Accelerator for the neutral particle beam program sponsored by the Strategic Defense Initiative Organization. In the case of the free-electron laser, another strategic defense research initiative, we are working with Boeing Aerospace to develop the radio-frequency free-electron laser concept. These collaborations show clear signs of success.

The weapons laboratories have not restricted their technology transfer to only defense-oriented companies. In the past few years, medical/biological, materials, geotechnical, and instrumentation industries have been particularly active in technology transfer interactions with Los Alamos, and our record shows many successes.

In addition to contributing to technology transfer as "providers," the Laboratory has been a significant technology user. For example, Los Alamos and other DOE laboratories have had a great impact on the supercomputer industry, high-power laser industry, and various other technological industries by providing a demand (market) for unique and highly sophisticated technologies.

Legislation, executive orders, and attention given by various federal agencies and by Congress to promote technology transfer have created a new climate in which support to economic competitiveness may become one of the most important benefits to come from our laboratories. We have seen many important changes in the recent past. For example, the DOE Assistant Secretary for Defense Programs has created an office, reporting to him, to foster technology transfer, and a complementary organization has been established at the DOE's Albuquerque Operations Office. DOE Secretary Herrington requested the Energy Research Advisory Board to study technology transfer and recommend ways in which the DOE and DOE laboratories could be more effective. That study is now complete and offers the DOE a number of recommendations and suggestions for improvement. Finally, the recently nominated DOE Under Secretary, Donna Fitzpatrick, has very strong interests and experience in this subject.

In brief, we support the DOE's willingness to explore new and innovative modes of industry/laboratory/university interactions that facilitate and expedite technology transfer from the laboratories and universities to the private sector for commercialization. We are committed to timely and more effective technology transfer of our laboratory's science and engineering.

B. Technology Transfer--Recent Thrusts/Activities

At the request of Secretary Herrington on July 30, 1987, we undertook a study (the Herrington Initiative) of private-sector interest in and models for establishing industry/laboratory research and development (R&D) programs for commercial applications of high-temperature superconductivity (HTSC). Workshops, mail questionnaires, participation in conferences, and one-on-one visits provided insight concerning industrial perceptions and needs. In all of these interactions, we found enthusiastic industry interest in the new superconductors and a general appreciation for the efforts of the DOE and its laboratories to increase the access of the private sector to their R&D capabilities. However, early in our campaign to determine industrial interest, several important facts became clear. First, only one reason exists for industry interest in collaboration with DOE laboratories: assistance in attaining their business objectives. Second, there is a strong recognition that the private sector must move extremely quickly in the area of HTSC to gain a competitive edge. Third, those companies experienced in dealing with DOE laboratories are concerned about the time involved in establishing and gaining approval for specific agreements.

Many companies we interacted with were skeptical of the depth of DOE and laboratory interest in and commitment to technology transfer, largely because they do not see a strong link between DOE/laboratory objectives and their own. They feel that the laboratories should not "be a solution looking for a problem, but should respond to industry's ideas and requests without being condescending." They hear the statements we make and want to accept them, but they do not yet see a substantive commitment of DOE/laboratory resources to industry collaboration. To quote one company representative, "DOE has to put something at risk to prove their sincerity. We are." It is clear that industry expects any partnership to begin with DOE investment of resources before substantial private funds are forthcoming.

A specific proposal to the DOE came out of our industrial interactions for the Herrington Initiative and from our strong belief that laboratories can do more to enhance technology commercialization. We proposed that the DOE establish a network of Exploratory R&D Centers (ERDCs) at its laboratories with the objective of helping U.S. industry develop the enabling technologies necessary for the rapid commercialization of new superconductor applications and devices.

We believe that this ERDC initiative will provide the necessary focus and framework for the laboratories' interactions with industry and, when appropriate, with universities. The laboratories will enhance the DOE ERDC investment with existing basic research and applied research funds from both the DOE and other government agencies.

Private industry has shown great interest in interacting with many of the DOE laboratories. However, industry has also made it clear that the present cumbersome process of contracting with the national laboratories and the generally conservative nature of the DOE concerning intellectual property and data rights make the laboratories questionable partners for most joint ventures. Industry has strongly urged that the DOE revise its policies to encourage and facilitate industry access to the laboratories.

As pointed out by Los Alamos National Laboratory Director Sig Hecker in his June 23, 1988, testimony to this committee, the DOE must expedite and streamline the approval process for industry/laboratory agreements and contracts and relax its position on data and intellectual property rights. The DOE should develop policy guidelines and then delegate most of the authority for negotiating agreements and intellectual property rights to the laboratory directors, with final approval authority at the respective DOE Operations Offices. To initiate these changes quickly, we proposed that such new procedures be tried first on a pilot basis.

II. LOS ALAMOS EXPLORATORY RESEARCH AND DEVELOPMENT CENTER IMPLEMENTATION UPDATE

A. Superconductivity Pilot Centers

On April 21, 1988, Secretary Herrington responded to our ERDC proposal by announcing that three Superconductivity Pilot Centers would be created "to collaborate with industry in advancing high-temperature superconductivity technologies." In addition to Los Alamos National Laboratory, pilot centers were created at Argonne National Laboratory and Oak Ridge National Laboratory. The announcement said that the pilot centers would be designed "to facilitate collaboration between the laboratories and industry by speeding up the contracting and project approval process and the transfer of patent rights and other intellectual property." Also, the centers would be expected to "enable industry to participate early in the process and to help focus research on the technologies that will be needed to make superconducting products."

Since that announcement, we have been working with DOE Headquarters and Operations Offices personnel, Argonne, and Oak Ridge to develop plans to implement the three pilot centers. Cooperation in this work among the three laboratories is excellent, as it is between our laboratory and the DOE Operations Office at Albuquerque. A major thrust of these interactions has focused on innovative ways for expediting and streamlining the contracting process and for simplifying the handling of rights to data and intellectual property. At the same time, we have continued to work with a number of companies in establishing new collaborations in HTSC R&D that will be integrated into our center as it develops.

An important industry concern regarding industry/laboratory collaborations is the time and bureaucratic process necessary for negotiation and approval of agreements for cooperative work. Assistant Secretary Donna Fitzpatrick has recommended to the DOE Operations Offices that negotiation and approval for collaborative agreements with industry through the pilot centers be delegated to the Operations Offices and laboratories as much as possible. Discussions among the laboratories and the DOE Operations Offices regarding contracting procedures for the centers have centered on developing standardized agreement submissions, extending negotiating authority to laboratory directors, and streamlining internal DOE review and approval processes. These discussions have resulted in a consensus among the laboratories and a proposal to the DOE for moving ahead.

Development of a common agreement format that is flexible enough to accommodate most collaborative R&D agreements with industry is under consideration. Such agreements need to handle cost-sharing between laboratories and industries, permit flexibility in transfer of patent and data rights to industry based on industry's share in funding the research, and satisfy contractual requirements of industry, laboratory, and the DOE. Approval of such agreements can be expedited by parallel (as opposed to serial) review and evaluation both internally by the laboratories and across the DOE. Contracting procedures developed for the centers should, when proven effective and accountable, be expanded to other DOE/laboratory activities.

B. Requirements for Technology Transfer

Paramount to any industry/laboratory partnership is determining ownership of information and intellectual property and protecting proprietary information. These issues surfaced repeatedly in the HTSC workshops. Individual companies need time and opportunity to capitalize on the fruits of their investments. The high cost of commercialization by industry (perhaps a factor of 100 over the cost of basic research and a factor of 10 over cost of development) underscored the persistent requirement for exclusive patent and data rights. Industry would like to see a simple, clear, and liberal intellectual property policy; speedy resolution of titles and licenses to patents; an up-front assurance of conditions under which intellectual property rights will be allocated; and assurances that company proprietary information generated in industry/laboratory cooperation will be protected. Industry executives expect to get what they pay for, and, conversely, they do not expect to get what they do not pay for. From their viewpoint, the key elements in implementing cooperative agreements are certainty, simplicity, and speed.

We believe the laboratories are in the best position to transfer to industry intellectual property generated at the individual facilities. Such transfers can achieve the proper balance between industrial access to certain basic information required to practice inventions and the exclusivity required for encouraging financial investment.

The pilot centers should develop a procedure for licensing patents to industrial sponsors that would meet the needs of industry, the government, and the national laboratories and develop the HTSC technology quickly and efficiently. That is, once inventions were assigned to the operator of the laboratory at which the invention originated, carefully orchestrated licensing procedures would be called into action. For example, if, for simplicity, a generic center/industry interaction is designated as a Cooperative Agreement, rights in inventions could be granted by the laboratory contractors according to a sliding scale of industrial contribution and a consideration of who the inventors were.

It is important to recognize that flexibility is the essential ingredient. For example, if a technical program is sufficiently risky, requires substantial financial investment, and is a desirable program to be performed at a center, it might be appropriate for the laboratories to reassign patent rights to the sponsor so that the sponsor may be able to attract additional support for the program. Otherwise, rights in inventions would be licensed. Existing DOE Funds-In-Agreements would be used for research fully funded by industry. With these agreements, industry is automatically assigned all rights to patents and technical data. Diligence clauses in license agreements would require the rapid commercialization of the inventions by the sponsor to avoid termination of the license arrangement.

We believe significant progress has been made through the cooperative efforts of the three laboratories and their DOE Operations Offices. We look forward to timely review and action by the DOE Headquarters on the recommendations that have been put forth.

C. An Emerging Opportunity

Last week, representatives from a number of oil and gas producers met with representatives from Los Alamos and Sandia National Laboratories, the Assistant Secretary for Fossil Energy, Senator Domenici, and others to discuss how the DOE laboratories would play a larger role in providing technologies useful to the oil and gas industry. As you know, that industry is severely depressed, and for certain segments the situation is critical. As the U.S. oil and gas industry declines, petroleum-based imports will inevitably increase. Already, they reached nearly $4 billion for May of this year--equivalent to an annual contribution of nearly $50 billion to this nation's trade deficit.

Industry representatives voiced a number of technical problems, illustrated by the following example. Small quantities of arsenic were recently detected in natural gas that apparently originated in New Mexico gas wells. Because of the toxicity of arsenic, the source wells have been shut in, at great loss of revenue to the producers and the state. Although there must surely be a technical solution to this problem, so far the producers have not been able to find one, and industry is asking the laboratories for help.

Participants at this meeting recognized that national laboratories have developed technologies that could be helpful to the oil and gas industry if they could somehow be made available. At Los Alamos, for example, we have developed a borehole televiewer, which gives an image of the inside of a borehole. It is particularly useful for determining the location and orientation of fractures that intersect the wellbore. Because many oil and gas production zones are associated with zones of fractured rock, this logging tool could have important economic benefits for the oil and gas industry.

Obviously we could use the procedures and practices for industry/laboratory interactions that are being developed for HTSC as models for interacting with the oil and gas industry. Because this industry is another time-urgent technology transfer area, we would attempt to develop new, innovative methods for leveraging the technology base of the laboratories into more strongly supporting national industrial needs.

III. COMMENTS ON DRAFT COPY--NATIONAL LABORATORY COMPETITIVENESS ACT OF 1988

We are pleased that the DOE is working to establish a framework within its new Superconductivity Pilot Center program whereby Los Alamos, with DOE approval centered at the Albuquerque Operations Office, can quickly and straightforwardly enter into cooperative research and development agreements with the private sector. We are also pleased that DOE is considering implementation of more flexible intellectual property policies for the pilot program. Finally, we are hopeful that early success of this pilot program will lead to extension of these new policies and procedures to other areas.

We believe that the findings set forth in Section 101 of the proposed National Laboratory Competitiveness Act of 1988 accurately represent the existing state of affairs. Implicit in those findings is the view that the DOE laboratories represent an immense national resource which has yet to be properly utilized in the arena of economic competitiveness. We wholeheartedly agree that domestic competitiveness can be greatly improved through scientific collaboration between the DOE laboratories and the private sector. Indeed, in our view, it was precisely because of findings such as those set forth in this bill that President Reagan issued Executive Order 12591 (Facilitating Access to Science and Technology) on April 10, 1987.

The DOE, however, has contended that, at least for Los Alamos and other DOE laboratories that are government-owned, contractor-operated facilities, it does not have authority under the law to apply the dictates of this executive order, particularly with regard to delegating to such DOE laboratories the authority routinely to enter into cooperative R&D agreements or permitting them to retain rights in software and other technical data. The DOE has reiterated on a number of occasions that new legislation must be enacted to achieve this objective. We believe that much progress can be made without new legislation, as is being proposed with the new superconductivity program. However, broader application of the executive order would still be appropriate, in our opinion. We perceive this bill and S. 1480, which has been introduced by Senator Domenici, to be statutory mechanisms by which the principles embodied in the executive order with respect to government-owned, government-operated laboratories can be applied to government-owned, contractor-operated laboratories as well. We believe it is in the national interest to apply those principles broadly to all federal laboratories.

We note with interest the similarities between this bill and S. 1480. We believe that either bill, if enacted into law, could materially enhance the abilities of the DOE laboratories to enter into collaborative arrangements with U.S. industry and to provide preferential or exclusive rights in technologies that are essential to assuring the private-sector investment necessary for the ultimate commercial development of such technologies. As the Japanese have repeatedly shown, cooperative efforts between government-funded laboratories and the private sector can result in tremendous national economic benefits.

We do have some rather strong concerns about certain specific aspects of this bill that we have set forth in a separate paper and would be willing to provide to the Subcommittee staff. We believe that those concerns can be readily addressed and worked out, and we would be pleased to provide such additional information as the Subcommittee staff may desire.

IV. CONCLUSION

In summary, we at Los Alamos are committed to the timely and proper transfer of laboratory technology to the private sector. Further, we have been extremely successful in doing so over the past four decades. Yet to remain a technological world leader we must develop new and better methods for future collaborative interactions between industry and the laboratories. Thus, we strongly support legislation that extends to government-owned, contractor-operated laboratories the same rights and privileges granted to government-owned, government-operated laboratories by Executive Order 12591; that facilitates timely negotiations and approvals of industry/laboratory agreements; and that defines and protects the rights of the public, the laboratories, and industry regarding intellectual property and data. Finally, we are encouraged by the recent productive meetings between the DOE and the laboratories to develop guidelines for establishing the Superconductivity Pilot Centers. We eagerly await approval and implementation of these new operating procedures and look forward to extending the application of these pilot procedures (or appropriate modifications) to a much wider segment of the laboratories' R&D activities.

The DOE laboratories have other important missions for the country; they cannot and should not attempt to replace industry's own R&D capabilities. However, we can do much more than we have been doing to turn the research capabilities necessary for our primary missions into improving the country's technological competitiveness. We are particularly strong in developing high-risk, generic technologies in the precompetitive, precommercial phase. The challenges of HTSC generic technology development and the national need to be competitive make this an ideal opportunity to implement new ways of establishing industry/laboratory partnerships. We see other such opportunities emerging and hope to take maximum advantage of them.

PANEL 2 DISCUSSION

Mr. **Morrison**. Thank you very much to all three of you, and your statements are very, very much in line with the efforts to see if we can fine-tune legislation and have it meet the needs of the country.

Dr. Hubbard, you mentioned the 20-percent prohibition is restrictive.

Would you expand on that? I know that SERI fills a unique position. Should we even have a limitation?

Dr. **Hubbard**. Oh, I think the intent of the limitation is desirable because it is intended to keep the laboratories focused on their primary mission.

In our case, the primary mission is a little bit different because, as Secretary Fitzpatrick pointed out, the whole focus of the conservation and renewable program—and we work primarily in support of that program—is to help establish an industrial base and transfer the scientific and technical knowledge based to industry in our case.

If collaborative is defined to include those situations in which we have a cooperative program with industry and subcontract to industry much of the work, then actually that's the preferred way for us to work in the evolution of the program. And if it was defined in that way, then it could conceivably be an impediment to us.

I don't think the 20 percent needs to be removed, but a clause which simply said it applies unless the agreement at a different level was agreed to—in the case of a particular leverage rate would be okay.

Mr. **Morrison**. You also mentioned, Dr. Hubbard, the short half life of Assistant Secretaries within the Department of Energy.

Do you feel that's a reason why maybe we should create some stability in this area of technology transfer through legislative action?

Dr. **Hubbard**. If the reason why technology transfer and the whole issue of technological innovation and the fostering of that needs to be firmly embedded into the Department, legislative action is certainly one way to do that. There may be other ways.

Secretary Fitzpatrick's leadership in this area has been very constructive and very, very positive. But I don't think over time one can depend on that. You will necessarily have that sort of leadership with that sort of intent unless it is really firmly spelled out.

One of my colleagues in testifying before the Energy Research Advisory Board on this whole subject—and they had a panel which dealt with the general nature of the technological competitiveness and technology transfer —pointed out that one of the things that inhibited the laboratories was because the laboratories were not sure whether this was just a fashion which was transitory, or whether it was a permanent change. Now, that statement was made almost a year ago. And the record since then would indicate that it is a real and substantive change—the climate has really changed, as John Whetten has pointed out.

Still, a reinforcement of that—I hate this word, but an "institutionalization" of that would be helpful and would be reassuring, and we intend to——

Mr. **Morrison**. The institution of Congress—we accept that.

Dr. **Hubbard**. But I think it would be helpful to industry, too, because, as somebody has pointed out, the major problem in industry cooperating with the Government in general—and it applies to the National Laboratories as well—has been that it is not a very reliable partner because of vacillation in policy changes and direction, erratic changes in funding, and the like. So a tendency towards stability in the R&D process would be very helpful.

Mr. **Morrison**. Thank you.

Dr. Wiley, when Pacific Northwest Laboratory was given its original mission, obviously there was some desire to do a little experimenting with this concept of within a Federal laboratory setting—a place that private enterprise could come, because of the unique nature of Battelle Memorial Institute, and plant its ideas and have them grow.

Could you expand on that for the record just a little bit as to how successful this has been; and has there been a great demand by industry to use this great opportunity that's been provided them?

Dr. **Wiley**. Yes, Congressman, we've had this agreement since 1965. Its purpose was to help to diversify the Tri-Cities—the Benton County area where most of the activities were associated with nuclear technology. And at the time there were reactors that were being shut down and you wanted to diversify into the activities of other Assistant Secretaries and to attract industry to the Tri-Cties area.

There have been a number of successes. For example, the Exxon Corporation came to town to take technology vis-à-vis this agreement that we've had to manufacture nuclear fuel. Since that time, over the years various companies have been started by virtue of the association with this contract where proprietary exclusivity is required in order for the company to proceed because there's a major investment there. And these companies range from Optical Data Systems—corporations that are located in the Portland region to "Geosafe," as you mentioned this morning, where we were able to grant exclusivity to these companies through the use of this private contract—they can come in and take generalized non-exclusive rights, which they pay for.

And the process is an excellent one and it requires a real partnership between the Government and Battelle, because Battelle has to pay for the use of the Government facilities and activities upfront, such that the Government is not prepaying.

Mr. **Morrison**. You really are in the job shop category, then.

Dr. **Wiley**. On that half of our business. But what I'd like to leave with you is supportive of the DOE contract. It is a partnership between Battelle and the Government, whose purpose is to support the efforts of the Department of Energy.

Mr. **Morrison**. I can understand with that beginning why you've emphasized the need for a very positive direction from the Department of Energy in this concept of technology transfer. In fact, all three of you have said that—flexibility, but give us the direction in which you want us to go.

Thank you.

I'm glad to yield, Mr. Fawell.

Mr. **Fawell**. Yes. Thank you.

Dr. Hubbard, you made the statement about what is a domestic entity and that clarification would be proper in that area.

What were you referring to then? I'm not sure that I——

Dr. **Hubbard**. Well, then I can give you an example. We are currently working with a group of companies—put together a consortium—which would pick up some research which was done at Government expense as part of the ECUT program, as a matter of fact, which was referred to earlier, and that's in the general area of recovering materials from wood waste that goes into adhesives, and there's several—some seven or eight companies that are interested in that.

One of them happens to be a company that was originally an American company—now is largely held in Canada by a Canadian company which is a subsidiary of a Japanese company. Is that a domestic entity or is it not?

And we're not sure, really, whether we should be working with them or not. As has been pointed out already, we try and have been directed by the Department, to be sure—as sure as we can—that the technology that we develop is utilized within the American economy and contributes to it. And there is some confusion about that.

I know it's been a problem in the collaborative work within the superconductivity industry, which several of those companies have been basically American companies that are foreign owned and there's been lots of discussion as to whether they should or should be part of the system; not just a problem to the Government, it's a problem to the industry too.

Mr. **Fawell**. All right—so that was—you were here while the first panel was testifying and that was——

Dr. **Hubbard**. Yes.

Mr. **Fawell** [continuing]. A point brought up. And I could see that as something that might be difficult to put into the proper legal words in the statute.

Dr. **Hubbard**. Right.

Mr. **Fawell**. But——

Dr. **Hubbard**. It may be you can't do any better than it's done in the bill that's drafted, as a matter of fact.

Mr. **Fawell**. There, again, I don't want to repeat myself, and I wonder if some of our competition may take more advantage of this than our American companies.

Dr. Whetten, did you have a point to make on that?

Dr. **Whetten**. In following through with the initiative to propose the Superconductivity Pilot Centers, we, as I indicated, interacted with a large number of private firms. And, in fact, telling those that were of U.S. ownership from those who were not of U.S. ownership proved to be a very difficult task for us. In fact, some we're still not sure of were those firms that we did interact with.

In discussing with the three laboratories and with the DOE field offices, we do find that there is a definition—I believe it originates in the Department of Commerce—which it appears that it might have some utility in which it essentially ignores the ownership aspect, but essentially states that American firms, for their own purposes—purposes of the Department—are those in which the manufacturing is essentially done within the United States. And this, you know, as the implications for labor force and all those sorts of things, which we really want to encourage. And it's one that we're looking into in terms of the Pilot Centers.

Mr. **Fawell**. That is an interesting point.

I think a number of those who have testified have referred to the lack of stability in funding—several times, insofar as industry is concerned. And it's true, I think industry today is doing less R&D than in the past, for a number of our own cultural reasons—not the least of which are the blasphemy of the get-rich-quick, and the quarterly returns, and long-term funding; putting you in a position where your profits are low and then you have raiders coming in and saying, "You're not doing what you should be doing," and so forth, and so on.

But I see it also as a problem insofar as Government is concerned. Quite awhile we're, I think that labs—and primarily because of instability of funding by Congress, also goes up and down insofar as what programs they can follow through on. So it strikes me as being a difficulty in changing cultures—to use your point of reference, Dr. Hubbard—to be a problem of a cultural change we're asking our government, and also a cultural change we're asking of business, which are changes in both areas; whereas, conversely, in some other countries—notably Japan—that is something that comes naturally; their culture is for government and business to work together, and to cooperate, and they see that as no big problem.

Did that comment make sense to you folks? Yes?

Dr. **Hubbard**. You know, I think it does, although I don't believe we can extrapolate Japanese systems here because they happen to be a remarkably homogeneous culture, and a remarkably homogeneous ethnically as well. But there seems to be a natural symbiosis among the three players in the scientific and technological game in Japan—academe, Government and industry.

I think we need to go in that general direction in this country. We'll have to do it in somewhat of a different pattern, I suspect, probably a little bit more chaotic one, because that's our nature, but hopefully more innovative because that's where our vantage seems to lie.

Mr. **Fawell**. I thank you very much.

Yes, Dr. Wiley?

Dr. **Wiley**. I would just, Mr. Fawell, I would just add to that, that there will have to be some changes in the American policy as it relates to incentives for paying for research. If you had tax laws that were consistent with R&D incenting R&D, it would impact this as much as the legislation we've been discussing today. I think that industry is there with a short-term mentality because the stockholders want to get quality—quarterly results. And if you can come up with the tax incentives, I think that industry will be revitalized by that, and they will use the generic research that is present in the laboratories rather than conducting generic research in their product development laboratories.

Mr. **Fawell**. Just in commenting, some of you may have seen public television last night on Zen Buddhists aspects as it invades all parts of Japanese life, including business, where there is allegedly, a spiritual connotation to the operation of business and, therefore, more of alleged looking out for the employee, revering the product, things of this sort, that I found to be very interesting.

Mr. **Whetten**. I'd like to make two comments to your question. One is that in addition to changing the culture of the Government and industry, I would certainly be the first to admit that we have some work to do to change the culture of the laboratories, too, and we're aware of that problem, and are working on it. I think we've been reasonably successful over the past couple of years.

The second is regarding sort of the amount of work that we might be doing from industry. The 20 percent figure which is given in the proposed bill really doesn't bother us because we would never see our activities with industry even coming close to that figure. Right now out of a close to a billion dollar budget at the Los Alamos Laboratory, I think we have some 3 or 4 million, which is paid for by industry, and we could double, triple, or quadruple that—and which we hope to do—but still be far, far under the 20 percent limit.

But that brings up a point which I think is fairly important, and that is that although we may do some applications development activities at the laboratory, which should be work that industry really ought to be paid for, they're going to be the chief beneficiaries of it; that I think really our best contribution—as I indicated in my testimony—can much better be in the sort of generic enabling technologies. And I think, frankly, we're going to have to face the fact that, like in Japan, the U.S. Government is going to have to be paying for that.

We're talking about sort of the pre-competitive types of research that industry would be involved. The real change that we see is we think we ought to be much close—more closely involved with industry in cooperative agreements. Industry really ought to have a voice—a stronger voice—than what is going on.

We ought to use the aspects of technology pull, and try to work cooperatively with industry so industry can have a voice on the activities that are going on at the laboratory.

Mr. **Fawell**. Thank you again, I appreciate the testimony.

Mr. **Morrison**. Thank you, and I'd like to thank this panel and all those who have, I think, made this so successful a hearing. Obviously, with the Chairman's bill in front of us, we do need to create a user friendly environment, if you will, with our National Laboratories. And all of you who have participated this morning have made a real contribution to helping us move wisely in that direction.

Dr. Dugan, anything else that the Chairman would want us to——

Mr. **Dugan**. I don't think so. The markup is tentatively scheduled for next Wednesday.

Mr. **Morrison**. The markup scheduled for next—on this legislation?

Mr. **Dugan**. Yes, sir.

Mr. **Morrison**. I would ask unanimous consent that a statement I have prepared be—appear as part of the record. And with that, we stand adjourned.

[Whereupon, at 12:05 p.m., the Subcommittee was adjourned.]

APPENDIX 1

Additional Materials for the Record

Irwin Welber
President

Sandia National Laboratories
Albuquerque, New Mexico 87185

July 27, 1988

Honorable Marilyn Lloyd, Chairman
Subcommittee on Energy, Research and Development
House Committee on Science, Space and Technology
Suite 2321 Rayburn House Office Building
Washington, DC 20515

Dear Congresswoman Lloyd:

This is in reply to your letter dated July 15, 1988 requesting our comments on Title I of your draft bill entitled "National Laboratory Competitiveness Act of 1988." We understand the thrust of the bill to be to delegate increased responsibilities and authorities to national laboratory personnel for the management of intellectual property in support of technology transfer.

We believe that the national interest and national security depend both on precluding technology transfer to adversaries and on increasing technology transfer to U. S. industry. Present policies, however well intentioned, can detract from national security and technology transfer by forcing an emphasis on unrestricted dissemination of unclassified information. This probably benefits our economic and military competitors at least as much as U. S. industry.

The solution lies in allowing the laboratories to control the dissemination of unclassified and non-sensitive information in order to meet competitiveness and security objectives. Thus, without commenting on specific language in your draft bill, overall we read Title I as being in the right direction.

Thank you for soliciting our comments on this important legislative proposal.

Irwin Welber

OPENING STATEMENT BY THE HONORABLE MANUEL LUJAN, JR. (R-NM)

Hearing on the National Laboratory Competitiveness Act of 1988
Subcommittee on Energy Research and Development
Committee on Science, Space, and Technology
July 27, 1988

I first want to congratulate the Subcommittee Chairman, Mrs. Lloyd, for convening this hearing on this very important topic.

The Congress, and particularly the Science Committee, has had a long-standing and continuing interest in promoting the utilization of federally-funded research and technology.

There is the widespread perception that the Department of Energy (DOE) has been slow to implement technology transfer legislation. For example, proposed regulations to implement the Trademark Clarification Act of 1984 (Public Law 98-620), which amended the Bayh-Dole Act 98-620, were first promulgated by the Department of Commerce on April 4, 1985. However, final regulations were not published until March 18, 1987 -- nearlty two years later -- due to disagreements between the Department of Commerce and the DOE. In addition, the Committee has received numerous complaints from the contractors of individual DOE National Laboratories, as well as from the private sector, about the excessive length of time and effort required to obtain exclusive licenses or title to inventions from the DOE.

The geneses of the proposed Federal Laboratory Competitiveness Act of 1988 are S. 1480 and H.R. 3006, the Department of Energy National Laboratory Cooperative Research Incentives Act, introduced by Senator Domenici on July 10, 1987, and by me on July 23, 1987. On March 4, 1988, Senator Domenici proposed amendments to S. 1480, which included a new title, Title IV. Title IV revises and incorporates the technology transfer provisions of S. 1480. The proposed Federal Laboratory Competitiveness Act of 1988 is an amended version of Senator Domenici's Title IV.

I am convinced that such legislation is needed if we are going to be able to exploit fully the resources of our National Laboratories. I hope that the hearing will clarify what changes are needed in the draft bill so that the legislation will indeed best meet its objectives of facilitating technology transfer.

APPENDIX 2

ADDITIONAL MATERIALS FOR THE RECORD

July 18, 1988 9:00

100th CONGRESS
2D Session

H.R. ______________

IN THE HOUSE OF REPRESENTATIVES

Mrs. Lloyd introduced the following bill; which was referred to the Committee on ______________________________.

A BILL

To amend the Federal Nonnuclear Energy Research and Development Act of 1974 to improve the transfer of technology or devices developed by the Department of Energy National Laboratories, improve interagency cooperation between the Department of Energy and the other agencies with respect to technology transfer, and to authorize a multiagency program in superconductivity research and development.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, SECTION 1. SHORT TITLE.

This Act may be cited as the "National Laboratory Competitiveness Act of 1988."

TITLE I. TECHNOLOGICAL COMPETITIVENESS MEASURES

SECTION 101. FINDINGS.

Section 2 of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5901) is amended by inserting at the end the following:

"(f) Domestic competitiveness can be greatly improved through scientific collaboration with the Department of Energy National Laboratories.

"(g) The Department of Energy National Laboratories must be perceived as easily accessible in order for industry to seriously consider the laboratories as partners for collaborative research and development ventures.

"(h) The Secretary of Energy must delegate increased management authority for technology transfer to the Managers of the Department of Energy Operations Office or other field office managers if the government is to ensure timely consideration of proposed cooperative research and development agreements.

"(i) The present Department of Energy policy of disseminating computer software generated in its research programs through the National Energy Software Center, despite its commercialization potential, has at times benefited foreign companies more than domestic companies.

"(j) There should be a simple, timely review procedure concerning proposed agreements to utilize or further develop software and other technology generated under a Department of Energy research and development contract, or developed with Department of Energy funding.

"(k) The National Laboratories have demonstrated successes in technology transfer, but the effort can be significantly enhanced if--

"(1) industry becomes more aware of the National Laboratories' research and development projects and capabilities;

"(2) technology transfer is considered a significant part of the National Laboratories' mission;

"(3) the National Laboratories develop a better understanding of the potential needs of industry; and

"(4) industry collaborates with the National Laboratories' early enough in the research and development process to detect the potential of the products of research and development.

"(1) The National Laboratories should examine and implement new and innovative methods of communicating with private industry regarding the availability of laboratory user facilities and laboratory research and development projects.

SEC. 102. DEFINITIONS.

Subsection 9(m) of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5908(m)) is amended--

(a) by striking "and" at the end of paragraph (4);

(b) by striking the period at the end of paragraph (5) and inserting in lieu thereof a semicolon; and

(c) by inserting at the end thereof the following:

"(6) the term 'collaborative party' means a person who has entered into a cooperative research and development agreement with a National Laboratory as described in this section;

"(7) the term 'computer software' means recorded information, regardless of the form or the media in which it may be recorded, comprising computer programs or documentation thereof; and

"(8) the term 'cooperative research and development agreement,' or 'agreement' shall have the meaning given to "cooperative research and development agreement" in subsection 11(d) of the Stevenson-Wydler Technology Innovation Act of 1986, as amended (15 U.S.C. 3710a(d));

"(9) the term 'laboratory' shall have the meaning given to it in subsection 11(d) of the Stevenson-Wydler Technology Innovation Act of 1986, as amended (15 U.S.C. 3710a(d)), except that the performance of research, development, or engineering may also be by non-government employees of a contractor of the Department of Energy;

"(10) the term 'National Laboratory' means the contractor or other person managing or operating any Department of Energy "laboratory", as such term is defined in subsection 11(d) of the Stevenson-Wydler Technology Innovation Act of 1986, as amended (15 U.S.C. 3710a(d)), except that the performance of research, development, or engineering at such 'laboratory' may also be by non-government employees of such contractor or other person;

"(10) the term 'property' is to be construed liberally to mean any invention, improvement, computer software, technical data, or innovation made as a result of the research and development activities conducted by a National Laboratory, but does not include real property; and

"(11) the term 'technical data' means recorded information of an engineering or scientific nature regardless of the form or the media in which it may be recorded."

SEC. 103. COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS.

Section 9 of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5908) is further amended by adding at the end the following new subsections:

"(o)(1) GENERAL AUTHORITY. The Secretary of Energy shall promulgate through regulation, order, or written field directive--

"(A) generic cooperative research and development agreements which are not subject to further approval under paragraph (2); and

"(B) generic terms and conditions, which when included in negotiated (nongeneric) cooperative research and development agreements are not subject to further approval under paragraph (2).

"(2) The Secretary shall--

"(A) delegate to each field office manager, or Manager of a Department of Energy Operations Office, authority to approve negotiated (nongeneric) terms and conditions of cooperative research and development agreements recommended by a National Laboratory under such manager's oversight.

"(B) require each National Laboratory to delegate all authorities and responsibilities under this section to the employee who directly manages the Department of Energy laboratory.

"(3) Each National Laboratory may enter into generic agreements promulgated by the Secretary under paragraph (1) after consultation regarding the suitability of the collaborating party with the

Department of Energy field office manager or Manager of the Operations Office; or such laboratory may negotiate such agreements subject to approval pursuant to paragraph (1). Such agreements may include the *disposition or use of* property assigned or licensed to the National Laboratory by third parties or any property voluntarily assigned by National Laboratory employees. Such agreements may be with any other person, or combination of persons, including, but not limited to--

"(A) Federal agencies other than the Department of Energy;

"(B) units of State or local government;

"(C) industrial organizations, such as corporations, partnerships, limited partnerships, consortia, or industrial development organizations;

"(D) public and private foundations;

"(E) nonprofit organizations, such as universities; and

"(F) licensees of inventions, technical data, or computer software owned by the National Laboratory.

"(4) Any directive, order or regulation covering National Laboratory cooperative research and development agreements shall be guided by the findings in subsections 2(f) through 2(l) of this Act.

"(p) SPECIFIC AUTHORITY. Each National Laboratory may under the terms of any cooperative research and development agreement entered into pursuant to this section--

"(1) accept, retain, and use funds, personnel, services, and property from collaborating parties, and provide personnel, services, and property to collaborating parties;

"(2) grant or agree to grant in advance to a collaborating party licenses or assignments, or options to property made in whole or in part by a National Laboratory employee under the cooperative research and development agreement; and

"(3) to the extent consistent with the Department of Energy requirements and standards of conduct, permit employees or former employees of the National Laboratory to participate in efforts to transfer to the private sector any property such employees or former employees developed or made while in the service of the National Laboratory.

"(q) APPROVAL OF AGREEMENTS. The field office manager or the Manager of the Operations Office may disapprove or require the modification of any cooperative research and development agreement submitted to him pursuant to this section within 60 days of receipt of such agreement and recommendation by the National Laboratory. Such agreement shall be deemed approved and binding on all parties upon modification consistent with the comments of such manager, or, if such manager does not disapprove such agreement, upon the expiration of the 60 day period after the first receipt by such manager of such agreement and recommendation.

"(r) LIMIT ON AGGREGATE AMOUNT OF AGREEMENTS. The cumulative total of the Department of Energy funding of all cooperative research and development agreements entered into by each National Laboratory under this section may not exceed 20 percent of the National Laboratory's annual budget.

"(s) RECORDS OF AGREEMENTS. The Department of Energy headquarters, and each field office, Operations Office and National Laboratory shall maintain a record of all agreements entered into under this section.

"(t) AGREEMENT CONSIDERATIONS. A National Laboratory, in deciding what cooperative research and development agreements to negotiate, and a field office manager or Manager of the Operations Office, in deciding whether to approve such negotiated agreements, shall comply with paragraph 11(c)(4) of the Stevenson-Wydler Technology Innovation Act of 1980, as amended (15 U.S.C. 3710a(c)(4)).

"(u) DISPOSITION OF TITLE. (1) The Secretary of Energy shall dispose of the title to all property developed or made by a National Laboratory in the same manner as inventions are disposed of to small business and nonprofit contractors under chapter 18 of title 35, United States Code.

"(2) Whenever a National Laboratory develops or makes property to which the Department of Energy has determined (at the time of contracting for the management and operation of the Department of Energy laboratory) to retain title pursuant to paragraph (1), the title to such property shall be retained by the government unless--

"(A) the laboratory at which the property is developed or made requests title to such property, and

"(B) the Secretary of Energy does not notify the National Laboratory within 90 days of such request that the property is covered by an exceptional circumstances determination, is classified or has been designated sensitive technical information in accordance with existing provisions of law, other than those provisions of law involving export control.

"(3) Other than for exceptional circumstances as authorized pursuant to paragraph (1), the Secretary may not retain title to property without first determining that the property has been classified or has been designated sensitive technical information in accordance with applicable statutes other than those involving export control. The Secretary may not use export control statutes or regulations as a basis for refusing a request for title. If the Secretary does not notify the requesting National Laboratory, such Laboratory shall be deemed to have elected and received title to the property under the Government-wide contractor provisions as specified in paragraph (1). The Secretary may recover title to any property given to a contractor should such property be subsequently classified or designated sensitive technical information in accordance with applicable statutes other than those involving export control.

"(4) Notwithstanding any other provision of law, when the Secretary of Energy permits a National Laboratory to elect and receive ownership rights under this section, such ownership rights shall be subject to a royalty free license on the part of the United States to use and reproduce such property for United States governmental purposes.

"(5) The Secretary of Energy shall promulgate appropriate regulations, directives or orders precluding any National Laboratory, which has received title to property under this section, from receiving money or other direct benefit from the use or licensing of such property for the personal benefit of the contractor managing or operating the Department of Energy laboratory. This paragraph shall not be construed to preclude such National Laboratory from using such money or direct benefit for research and development associated with activities at the laboratory or to promote technology transfer as is authorized by law. //

"(v) PROTECTION OF PROPERTY. (1) Computer software and reports containing data (associated with applied research and not basic research) obtained or generated by a National Laboratory shall be held confidential and exempt from any law otherwise requiring their public disclosure for a period of up to two years as determined by the Secretary--

"(A) the technical data or computer software is commercially valuable; and

"(B) there is a reasonable expectation that disclosure of the technical data or computer software could cause substantial harm to the commercial application of such information.

"(2) A cooperative research and development agreement may provide that technical data or computer software, which meets the conditions of paragraph (1), be held confidential and exempt from any law otherwise requiring their public disclosure for a period specified in such collaborative agreement, not to exceed 7 years, if such data or software is obtained or generated--

"(A) by the Department of Energy or the National Laboratory pursuant to such cooperative research and development agreement; or

"(B) under a National Laboratory cooperative research and development agreement.

"(C) this section shall not be construed so as to restrict or limit the ability of any National Laboratory to build upon research and data produced by another National Laboratory, whether produced under a cooperative research and development agreement or otherwise.

"(3) Documentation disclosing technical data or computer software subject to nondisclosure under paragraphs (1) and (2) shall not be considered as agency records under any federal statute during the term of nondisclosure to the public.

"(w)(1) NATIONAL LABORATORY CONTRACTS. All Department of Energy contracts to operate a laboratory shall provide terms and conditions consistent with this section.

"(2) IMPLEMENTATION. The Secretary of Energy shall immediately enter into negotiations with the National Laboratories to amend all existing contracts for the management or operation of the Department of Energy laboratories, in accordance with this section. Pending such amendment, this section shall govern the disposition of all property developed or made by the National Laboratories."

"(3) COMPENSATION. Compensation to the United States government paid by a National Laboratory in return for retaining title to any property rights shall be subject to terms negotiated in the operating contract for any Department of Energy laboratory.

"(4) MARCH-IN RIGHTS. Each funding agreement for the operation of a Department of Energy laboratory shall contain a provision allowing the Department of Energy to require the licensing to third parties of property owned by the contractor that is subject to the provisions of this Act. Such provision shall ensure that the property is licensed and commercialized by affording similar Federal march-in rights provided for property under section 203 of title 35, United States Code, but will be applicable to all property for which title was acquired by the National Laboratories under this Act.

"(5) REGULATIONS. The Department of Energy in cooperation with other interested federal agencies, shall issue within 180 days after the date of enactment of this Act, including 30 days for public comment, regulations--

"(A) establishing a standard contract clause to implement this section in the Department of Energy contract for the management or operation of any Department of Energy laboratory; and

"(B) implementing the march-in rights under this subsection.

"(6) DEFINITION. For purposes of this subsection, "third parties" and "third party applicants" are domestic entities located in the United States whose research, development, and other activities occur substantially in the United States. Domestic entities include industrial organizations, corporations, partnerships, limited partnerships, industrial development organizations, public and private foundations, and nonprofit organizations such as universities and consortia."

SEC. 104. INTERAGENCY COOPERATION.

The Department of Energy, in implementing its authorities under the amendments made by this title, shall explore innovative ways to cooperate with other government agencies or as appropriate, and in particular, with the National Bureau of Standards, which is charged with competitiveness responsibilities under the authorities of its newly established Advanced Technology Program. The Department of Energy, in cooperating with any other Federal agency, should seek to minimize unnecessary duplication of programs, projects, and research facilities.

TITLE II. NATIONAL SUPERCONDUCTIVITY PROGRAM

SEC. 201. FINDINGS AND PURPOSES.

(a) FINDINGS. The Congress finds that--

(1) recent discoveries of high-temperature superconducting materials could result in significant new applications of these materials in such areas as microelectronics, computers, power systems, transportation, medical imaging, and nuclear fusion, among others; and, as is often the case with revolutionary scientific advances, most potential applications lie beyond our ability to predict them;

(2) full application of the new superconductors is expected to require long-term commitments by the public and private sector to support appropriate research and development programs;

(3) the Nation's economic competitiveness and strategic well-being depends substantially on the development and application of critical advanced technologies such as those anticipated to evolve from the new superconducting materials;

(4) the United States manufacturing industries confront strong competition in both domestic and world markets; leading foreign industrial countries, as well as developing nations, are increasingly taking advantage of modern technology and production techniques, innovative management focused on quality, less expensive labor, and favorable government support to produce manufactured products which

are competitive and often less expensive than products manufactured in the United States;

(5) whereas we have as a Nation been highly successful in the conduct of basic research in a variety of scientific areas, including superconductivity, other nations have been highly successful in the commercial and military application of the results of such fundamental research;

(6) if the United States is to regain its competitive advantage, it must commit sufficient, long-term resources toward solving processing and manufacturing problems in parallel with basic research and development;

(7) Federal agencies have responded aggressively to this exciting challenge by reprogramming funds into basic superconductivity science and research while informally coordinating their efforts to avoid unnecessary duplication and further commitment of Federal research moneys and efforts directed to manufacturing, materials processing, and fabrication technologies is essential so that their activities may be conducted in parallel with the basic science research;

(8) successful development and application of the new superconducting materials will require close collaboration among the Federal Government and the industrial and academic components of the private sector, as well as coherent coordination among the departments

and agencies of the Federal Government involved in research and development on superconductors;

(9) a committed Federal program effort with appropriate long-term goals, priorities, and provided with adequate resources is necessary for the rapid development and application of the new superconducting materials; and

(10) a national program should serve as a test of new agency authorities directed at technological competitiveness such as those provided to the Department of Energy.

(b) PURPOSES. The purposes of this title are--

(1) to establish a 5-year national program effort to research and develop new high-temperature superconducting materials with appropriate goals and priorities; and to establish a program for the technology transfer initiatives provided in title I of this Act.

(2) to designate the appropriate roles, mechanisms and responsibilities of various Federal departments and agencies in implementing such a national research and development program effort.

SEC. 202. RESPONSIBILITIES OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY; NATIONAL FEDERAL PROGRAM ON SUPERCONDUCTIVITY RESEARCH AND DEVELOPMENT.

(a) ESTABLISHMENT OF PROGRAM. (1) The Director of the Office of Science and Technology Policy, working through the Federal Coordinating Council for Science, Engineering and Technology, shall establish a 5-year National Federal Program on Advanced Superconductivity Research and Development (hereafter in this Act referred to as the "Superconductivity Program").

(2) The Director of the Office of Science and Technology Policy shall draw upon the recommendations and advice of the National Commission on Superconductivity and shall work in close collaboration with the Office of Management and Budget in developing the Superconductivity Program.

(b) CONTENT AND SCOPE OF PROGRAM. The Director of the Office of Science and Technology Policy shall include in the Superconductivity Program--

(1) goals and priorities for advanced superconductivity research and development to be carried out by individual departments and agencies and organizational elements therein;

(2) the guidance for responsibility in the conduct of advanced superconductivity research and development among the departments, agencies, and organizational program elements of the departments and agencies;

(3) estimates of current and proposed funding levels for such activities for the 5 years following the enactment of this Act for each of the participating departments, agencies, and organizational elements therein; and

(4) proposals for the participation by industry and academia

in the planning and implementation of the program.

(c) PROGRAM PLAN. The Director of the Office of Science and Technology Policy shall submit a written Superconductivity Program plan to the Committee on Science, Space, and Technology of the House of Representatives, and to the Committees on Energy and Natural Resources, and Commerce, Science, and Transportation of the Senate, within 9 months after the date of the enactment of this Act.

(d) REPORTS. (1) The Federal Coordinating Council on Science, Engineering, and Technology shall annually report to the Director of the Office of Science and Technology Policy on its findings as to the progress of the Superconductivity Program.

(2) The Director of the Office of Science and Technology Policy shall prepare an annual written report setting forth and evaluating the findings of the Federal Coordinating Council on Science, Engineering, and Technology received by the Office pursuant to paragraph (1). This report shall be submitted with the President's proposed budget for the government to the Committees on Science, Space, and Technology of the House of Representatives, and to the Committees on Energy and Natural Resources, and Commerce, Science, and Transportation of the Senate.

SEC. 203. DEPARTMENT OF ENERGY.

The Secretary of Energy shall conduct a program in superconductivity research and development utilizing the authorities provided pursuant to Title I of this Act. Within 180 days of the date of enactment of this Act, and for the two succeeding years thereafter, the Secretary shall submit annual reports in writing on the implementation of these authorities with respect to Superconductivity research and development to the House Committee on Science, Space, and Technology and to the Senate Committee on Energy and Natural Resources. Such report shall include recommendations for improvements in the technology transfer between government and industry and management of property developed or made at the National Laboratories.

SEC. 204. NATIONAL BUREAU OF STANDARDS.

In achieving the purposes of this title, the Director of the National Bureau of Standards shall conduct a program of fundamental research and to establish materials standards to accelerate the use and application of the new superconducting materials, and continue to establish and operate a Superconductivity Center Focusing on Electronic Applications at the National Bureau of Standards in Boulder, Colorado.

SEC. 205. NATIONAL SCIENCE FOUNDATION.

The Director of the National Science Foundation shall conduct a program of fundamental research to achieve the purposes of this title.

SEC. 206. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION.

The Administrator of the National Aeronautics and Space Administration shall conduct programs to promote the commercial applications of high temperature superconductors, including, but not limited to, applications relating to thin film technology, communications technology, sensors, space power and propulsion to achieve the purposes of this title.

SEC. 207. INTERNATIONAL COOPERATION.

The President, as part of the Superconductivity Program, shall establish a program of international cooperation in the conduct of fundamental and basic research on superconducting materials. Such program of international cooperation shall include the exchange of basic information and data, as well as the development of international standards for the use and application of superconducting materials.

SECTION BY SECTION ANALYSIS OF THE NATIONAL LABORATORY COMPETITIVENESS ACT OF 1988

The bill is entitled the "National Laboratory Competitiveness Act of 1988"

TITLE 1

The entire title amends the Federal Non-nuclear Energy Research and Development Act of 1974.

Section 1 adds seven new findings indicating that domestic competitiveness can be greatly improved through scientific collaboration with the national laboratories; laboratories must be perceived as "user-friendly"; technology transfer authority must be delegated to the operations offices; existing policies on software dissemination have benefited foreign corporations; simple, timely reviews are needed on software transfer; increased industry awareness is needed of DOE projects and capabilities; improved technology transfer will result if it is considered a laboratory mission, if the labs better understand industry needs, and if industry is involved early in the R&D process; and, the labs should use new methods of communicating with industry.

Section 2 defines six terms used in title 1, to wit, collaborative party, computer software, cooperative research and development agreement, National Laboratory, property, and technical data.

Section 3 adds new subsections (g) through (p) to section 9 of the Federal Non-nuclear Act.

Subsection (g)(1) requires the Secretary of Energy to preapprove (1) generic cooperative research and development provisions and entire agreements for use by the National Laboratories.

Subsection (g)(2) requires the Secretary of Energy to delegate authority to approve National Laboratory recommendations for all nongeneric provisions and agreements to the DOE field office manager.

Subsection (g)(3) authorizes the National Laboratories to negotiate and enter into approved agreements.

Subsection (g)(4) requires the Secretary in promulgating directives or regulations to take into consideration the findings of the Act.

Subsection (h) provides authority for the National Laboratory to include several provisions in cooperative R&D agreements: (1) to use the collaborating parties property or personnel; (2) to agree to grant advance licenses to collaborating parties; and, (3) to permit National Laboratory employees or former employees to participate in technology transfer.

Subsection (i) authorizes the DOE field office manager to decide on the approval of an R&D agreement recommended by a National Laboratory within 60 days. Provides for automatic approval after 60 days if no decision is made, or upon modification of the agreement consistent with the comments of the manager.

Subsection (j) limits the cumulative total of the federal funding of all agreements entered into by a National Laboratory to a maximum of 20 percent of the laboratory's annual budget.

Subsection (k) requires the maintenance of records on all agreements.

Subsection (l) requires the National Laboratory in negotiating R&D agreements to consider (1) the opportunity for small business and university participation; (2) U.S. business preference; and (3) reciprocal agreements with foreign governments.

Subsection (n)(1) requires the Secretary of Energy to give all property developed at the labs to the labs. Under subsection (n)(2), If the Secretary has contractually retained title to property because of exceptional circumstances, and the National Laboratory requests title, the Secretary has 90 days to consider or deny the request based upon his determination that the property is classified or has been designated sensitive technical information. Subsection (n)(3) prohibits the Secretary from retaining title to property withheld because of exceptional circumstances unless he determines that the property is classified or has been designated sensitive technical information. Subsection (n)(4) requires the Secretary to retain a royalty free license for the United States to use the property given to the labs. Subsection (n)(5) precludes a contractor from using the property for its own benefit.

Subsection (o)(1) requires the Secretary of Energy to withhold computer software and technical data from public disclosure for up to two years if it is commercially valuable and public disclosure would cause substantial harm to the commercial application. Subsection (o)(2) permits a cooperative R&D agreement to provide for up to seven years protection from public disclosure of computer software and technical data developed under the agreement. Subsection (o)(3) requires that withheld software or data not be considered as agency records during the term of nondisclosure.

Subsection (p)(1) requires DOE lab contracts to be consistent with the section. Subsection (p)(2) requires existing contracts to be modified in accordance with the section. Subsection (p)(3) requires DOE to negotiate a provision in the operating contract for a lab setting the compensation to be paid to the government for property given to the contractor. Subsection (p)(4) requires DOE to include in lab contracts a provision enabling DOE to require a contractor to license property that DOE gives to the contractor. It also allows DOE to recover title to transferred property if the contractor does not license the property in accordance with existing law to the private sector, i.e. establishes march-in rights. Subsection (5) requires DOE to issue regulations within 180 days establishing standard lab contract provisions and standard march-in rights. Subsection (6) defines "third parties" and "third party applicants" for purposes of the subsection.

Section 4 of the Act requires DOE to explore innovative ways to cooperate with other federal agencies in using authorities granted in title 1 of the Act.

TITLE II. NATIONAL SUPERCONDUCTIVITY PROGRAM

Section 1 sets for findings and purposes. Findings. (1) High-temperature superconductors could result in significant new applications; (2) applications will require up a long-term commitment 20 years to develop; (3) national competitiveness depends on such applications; (4) foreign countries are highly competitive; (5) other nations beat U.S. to applications of fundamental research; (6) sufficient, long term resources must be committed in U.S.; (7) federal agencies have reprogrammed resources into superconductor research; (8) close collaboration is required; (9) a committed federal program is needed for rapid development; (10) national program on superconductivity should serve as a test of new agency authorities.

Purposes. (1) To establish a 5 year R&D program on superconductors, to establish a program within DOE for the technology transfer initiatives in title I; and (2) to designate the appropriate federal roles in the R&D program.

Subsection 2(a) requires the Director of the Office of Science and Technology Policy (OSTP) to establish a 5 year Superconductivity program drawing on the advice of the National Commission on Superconductivity. Section 2(b) requires the Director to include in the program-- (1) all the goals and priorities of the federal agencies, (2) the guidance for agency responsibility, (3) estimates of current funding, and (3) proposals for industry participation.

Subsection 2(c) requires the Director to submit to Congress a program plan.

Subsection 2(d) requires the Federal Coordinating Council on Science, Engineering, and Technology (FCCSET) to annually report to the Director on the program. The Director is required to evaluate the FCCSET report and send his report to Congress.

Section 3 requires the Secretary of Energy to conduct a superconductivity R&D program using the authorities in title I. Three reports to Congress are required over a 2 $^1/_2$ year period.

Section 4 requires the Director of the National Bureau of Standards to conduct a program of fundamental research and to establish materials standards, and to continue to establish a Superconductor Center in Colorado.

Section 5 requires the Director of the National Science Foundation to conduct a program of fundamental research to achieve the purposes of this title.

Section 6 requires the Administrator of the National Aeronautics and Space Administration to conduct programs to promote the commercial applications of superconductors.

Section 7 requires the President to establish a program of international cooperation in the conduct of fundamental research on superconductors, including exchange of data, the development of standards, and applications.

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